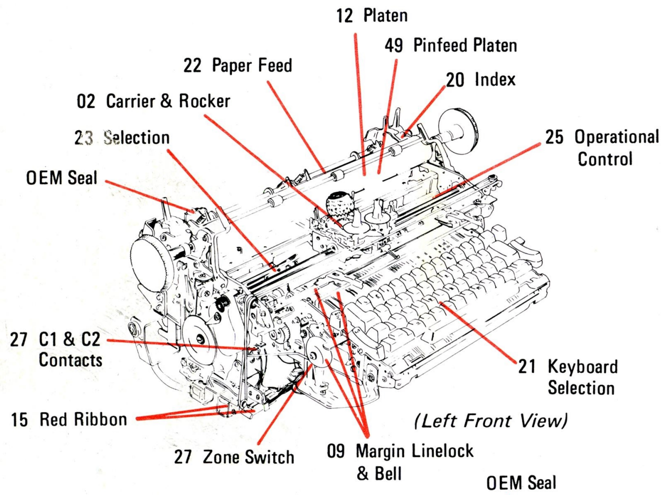
IBM

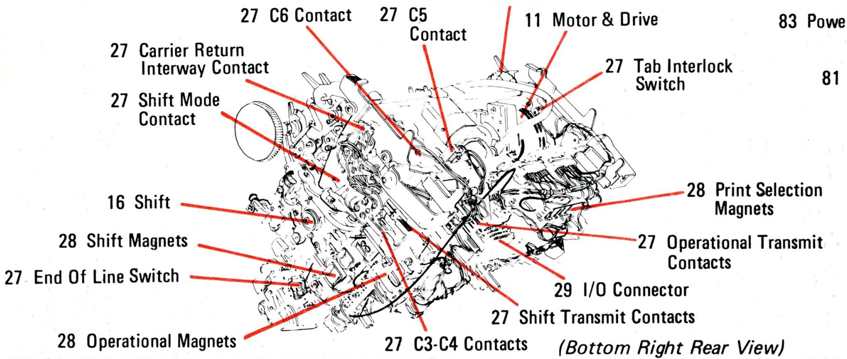
MT/ST I/O

Adjustment Parts Manual

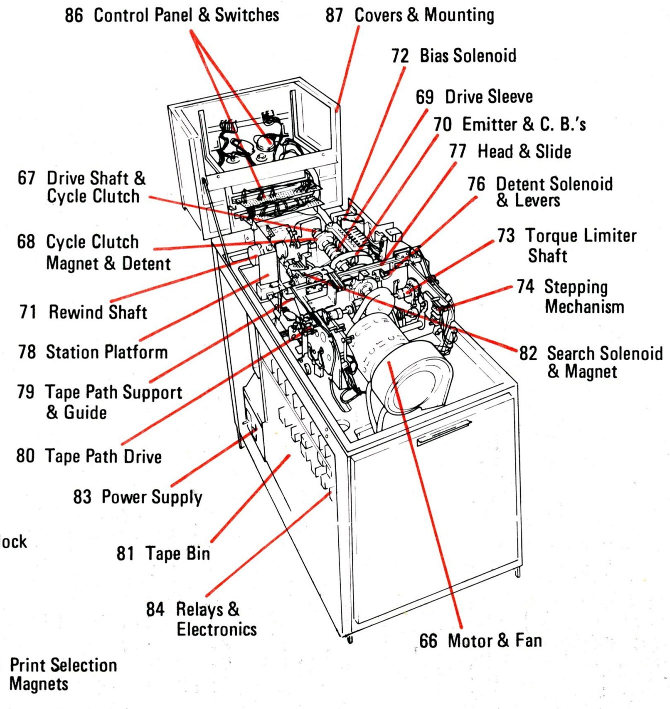
Magnetic Tape "Selectric" Typewriter
"Selectric" Input/Output Typewriter



(Left Front View)



(Bottom Right Rear View)



(Rear View)

Copyright© By International Business Machines Corporation
1969, 1970, 1971, 1973, 1977

"IBM", "Executive", "IBM EXECUTARY", and "Selectric" are registered trademarks of the International Business Machines Corporation.

MT/ST
CONTENTS
(Alphabetical)

PARTS			ADJUSTMENTS	
Mech. Code	Page	Mechanism	Frame	Page
		INTRODUCTION		i
		GENERAL INFORMATION		
		Cause Of Failure		*(Inside Rear Cover)*
		Inspection Procedure		*118*
		Machine Identification Codes		*(Inside Rear Cover)*
		Mechanism Locators		*(Inside Rear Cover)*
		Packing Instructions		*172*
		MT/ST		
84	*168*	*Auxiliary Relay Gate*		
72	*160*	*Bias Solenoid*	*16*	*2*
89	*172*	*Cable Assemblies*		
86	*168*	*Control Panel Switches*		
87	*170*	*Cover Hardware*		
87	*169*	*Covers & Mountings*		
68	*158*	*Cycle Clutch Magnet & Detent*	*5*	*1*
88	*171*	*Desk Hardware*		
76	*161*	*Detent Solenoid & Levers*	*41*	*5*
67	*157*	*Drive Shaft & Cycle Clutch*	*5*	*1*
69	*158*	*Drive Sleeve*	*21*	*3*
70	*159*	*Emitter & CBs*	*24*	*3*
77	*162*	*Head & Slide*		
		Head Alignment	*62*	*7*
		Head Cable Clamps	*78*	*9*
		Head Position (Search)	*68*	*8*
		Head Slide Bearings	*54*	*6*
		Home Position Contacts	*72*	*8*
66	*157*	*Motor & Fan*	*1*	*1*
63	*165*	*Power Supply*		
84	*166*	*Relays & Electronics*		
71	*159*	*Rewind Shaft*	*14*	*2*
82	*164*	*Search Solenoid & Magnet*	*51*	*6*
84	*167*	*SLD Electronic Gates*		
78	*162*	*Station Platform*	*55*	*6*
		Station Covers	*75*	*9*
74	*161*	*Stepping Magnet*	*26*	*3*
81	*164*	*Tape Bin*	*35*	*4*
80	*163*	*Tape Path & Drive*		
		Bias Clutch	*16*	*2*
		Cartridge Interlock	*20*	*2*
		Chute	*32*	*4*
		Leader Sensing	*74*	*9*
		Sprocket Assembly	*31*	*4*
		Switches	*69*	*8*
		Tape Drive (Search)	*46*	*5*
79	*163*	*Tape Support & Guide*	*57*	*6*
73	*160*	*Torque Limiter Shaft*	*38*	*4*
88	*171*	*WT Typing Desk Parts*		
90	*172*	*WT Unit Packing*		
		DIAGNOSTICS		
		Card Reader Test Procedure		*24*
		CE Aids		*10*
		Contact Timing		*3*
		Library Option Test Procedure		*22*
		Master Test Tape Codes		*11*
		Oscilloscope Controls		*14*
		Paragraph Indent Checkout		*23*
		Preventive Maintenance		*20*
		Program Search Test Procedures		*22*
		Relays & Electronics		*13*
		Tape Deck Switches		*12*
		Tape Storage Information		*11*
		Wave Shapes		*15*
		DIAGNOSTIC CHARTS		
		Adjust (CR Code)		*18*
		Adjust (Space Code)		*17*
		Playback		*16*
		Playback Errors		*19*
		Record		*16*
		Record Error		*18*
		Record Failures		*18*
		Record Reference		*16*
		Rewind		*16*
		Search		*17*
		Search Failures		*19*
		FUNCTION CHARTS		
		Adjust Carrier Return		*33*
		Adjust Hyphen		*32*
		Adjust Space		*32*
		Encode Reference		*28*
		Error Correct B.S.		*27*
		Hot Keyboard		*41*
		Line Return		*37*
		Load		*39*
		Playback		*29*
		Record		*26*
		Rewind		*36*
		Search		*34*
		Skip		*40*
		Switch		*38*
		Unload		*39*
		SPECIAL FEATURES FUNCTION CHARTS		
		Carrier Return Index		*65*
		Code Conversion		*47*
		Composer Compatibility		*56*
		Forward Index		*64*
		Master Slave		*66*
		Reverse Index		*64*
		Reverse Search		*43*
		Rewind Search		*45*
		Transfer Feature		*61*
		Vertical Format		*63*

"SELECTRIC" I/O TYPEWRITER
CONTENTS
(Alphabetical)

PARTS			ADJUSTMENTS	
Mech. Code	**Page**	**Mechanism**	**Frame**	**Page**
		"SELECTRIC" I/O TYPEWRITER		
30	150	.Acoustic Hood		
01	119	.Backspace	202	94
29	149	.Cable & Connector		
02	119	.Carrier & Rocker		
		Fine Alignment	111	82
		Print	122	83
03	121	.Carrier Return	230	98
		.Character Selection		
23	140	Cycle Shaft	1	69
28	147	Magnets, Selection (Output)	96	79
28	149	Pushers, Selection Latch (Output)	96	79
23	141	Selection Latches, Tilt & Rotate	64	76
27	145	Transmit Contacts (Input)	93	79
		.Contacts & Switches		
27	144	C1 & C2	09	69
27	144	C3 & C4	51	75
27	144	C5 & C6	189	92
27	144	Carrier Return Interlock	239	99
27	144	End Of Forms Switch	315	109
27	144	End Of Line	291	106
27	144	Keyboard Mode Contact	38	73
27	144	Last Column Switch	289	106
27	145	Operational Transmit Contacts	191	92
15	131	Red Ribbon Shift Mode Contact	299	108
51	153	Reverse Index Contact (C8)	312	109
27	145	Selection Transmit Contacts	93	79
27	144	Shift Mode & Shift Transmit	51	75
50	152	Vertical Forms Control Switches	316	109
27	144	Zone Switch	289	106
		.Cords & Mainspring	165	88
04	122	.Covers & Mounting	319	110
		.Cycle Clutch Trip Mechanism (Output)	107	81
28	146	.Dead Key (Output) WT		
06	123	.Escapement	151	86

PARTS			ADJUSTMENTS	
Mech. Code	**Page**	**Mechanism**	**Frame**	**Page**
08	124	.Frames		
20	135	.Index	249	100
10	126	.Keyboard Lock – Electrical	30	72
10	126	.Keyboard Lock – Mechanical	26	71
21	135	.Keyboard Selection	13	70
09	125	.Linelock & Bell	280	105
		.Magnets (Output)		
28	146	Dead Key (WT)		
28	146	Keyboard Lock Solenoid	30	72
28	146	No Print Space	148	86
28	146	Operational	198	93
15	131	Red Ribbon Shift	292	107
51	153	Reverse Index	308	109
28	147	Selection	96	79
28	149	Selection Latch Pushers	96	79
28	146	Shift	58	75
28	146	Velocity Control	148	86
09	124	.Margin	280	105
11	127	.Motor & Drive	3	69
28	146	.No Print Space, Velocity Control – Electrical	148	86
21	137	.No Print Space, Velocity Control–Mechanical	138	85
		.Operational Control		
25	142	Bracket Assembly	183	91
28	146	Magnets	198	93
25	142	Shaft Assembly	164	88
27	145	Transmit Contacts & Contact Latches	191	92
65	154	.Packing Parts & Instructions (U.S.)		
65	155	.Packing Parts & Instructions (WT)		
22	137	.Paper Feed	240	99
49	151	.Pin Feed Platen	300	108
12	129	.Platen	257	101
		.Print	122	83
51	153	.Reverse Index	304	108
13	129	.Ribbon, Fabric	258	102
14	130	.Ribbon, Film	267	103

PARTS			ADJUSTMENTS	
Mech. Code	**Page**	**Mechansim**	**Frame**	**Page**
15	131	.Ribbon, Red Ribbon Shift	292	107
40	151	.Roll Paper Holder		
		.Selection		
23	140	Character Selection	64	76
21	135	Keyboard Selection	13	70
28	147	Magnets	96	79
28	149	Selection Latch Pushers	96	79
27	145	Transmit Contacts	93	79
16	131	.Shift	39	73
28	146	.Shift Magnets	58	75
27	144	.Shift Contacts (C3-C4, Shift Mode & Transmit)	51	75
17	132	.Spacebar	168	88
18	133	.Tab	206	95
27	144	.Tab Interlock Switch	218	96
50	152	.Vertical Forms Control	316	109
28	146	.Velocity Control, No Print Space – Electrical	148	86
21	137	.Velocity Control, No Print Space–Mechanical	138	85

DIAGNOSTICS

BCD Code Chart (Bit Codes) 114
BCD Diagnostic Charts 113
Broken Tape Check 117
Component Identification 112
Contact Location 111
Film Ribbon Samples 111
Inspection Procedures 118
Machine Check 118
Terminal Block Location 111
Tilt – Rotate Selection Schedule (BCD & Corres.) 115
Typehead Layout 115
Wiring Diagrams
  BCD 116
  Correspondence 116
  MT/ST 117

INTRODUCTION

This manual is written for both US and World Trade usage. It contains sections for adjustments, diagnostics and parts manual.

Product Name	Product Code
Magnetic Tape "Selectric" Typewriter	23
"Selectric" I/O Typewriter	22

For model numbers, see the inside rear cover.

ADJUSTMENT SECTION

Purpose

This section provides experienced service personnel a reference for the most commonly used adjustments. Refer to other Product Service publications if additional information is needed.

Adjustment Identification

The headline of each page shows the product name, product code and the name of the mechanism covered on that page. Each adjustment is indicated by a black frame number on the top left corner, followed by the adjustment name and mechanism code/reference number. The machine mode, the view of the drawing and safety precautions are also noted when required.

Adjustment Sequence

The frame numbers indicate the sequence of adjustments. One adjustment could affect a following adjustment. Therefore, check all the following adjustments in that mechanism. A vertical red line indicates the end of the mechanism.
Red numbers on the bottom left corner of the frame indicate adjustments out of sequence that could be affected and should be checked.

Adjustment Procedure

The part to be adjusted is colored red and a red arrow shows the direction of movement. Tolerances and/or additional information on how to perform the adjustment are shown when required.
Always use the adjustment tolerance shown in the publication with the latest date.

Call Reporting (US Only)

Mech. code, fail. code and part ref. are not required on MT/ST calls. All other applicable entries are required.

DIAGNOSTICS SECTION

Function Checks – Provide a reliable procedure to test the different mechanisms for failure.

Flow Charts – Provide a block logic procedure of finding problem areas.

Diagnostic Tapes – Contain prerecorded information designed to test functions and help diagnose machine and/or formatting problems.

PARTS MANUAL SECTION

Introduction

This section contains parts drawings of mechanisms, reference numbers and other special information. It must be used with a separate part number/price list which contains reference numbers, part numbers, part descriptions and prices.

Mechanism Identification

The headline of each page shows the product name and product code covered on that page. The headline of each frame shows the mechanism name and the mechanism code covered in that frame. Numerical part references separated by a dash (e.g., 22-174) refer to another mechanism for ordering information. The mechanism numbers precede the dash. Some mechanisms require more than one frame. However, each mechanism consists of a group of parts that work together to perform a function.

Parts Identification

Red numbers indicate the reference number of a part, a bill of material (B/M) or an assembly.
Red blocks within a frame indicate either one, or a combination of more than one, of the following:

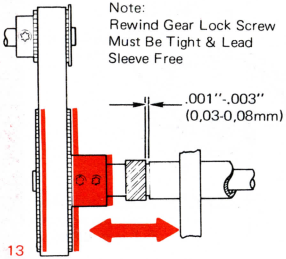
- Differences between features.
- Different levels within the same model (level 1, level 2, etc.).
- Field replacement parts.
- Bill of material (B/M) or assemblies (shown with a description – parts shown in the drawing).
- World Trade application or differences.

If different levels exist, which can be used for all models, only the newest level is shown in the drawing. However, the part number/price list will show all level parts.
Some parts are shown for assembly purposes only and do not show a reference number. Replace these parts by ordering either the assembly or a later level part.

Parts Ordering

Locate the mechanism in which the part functions by using the contents page. Note the mechanism code, find the part in the drawing and note the reference number. Use the mechanism code/reference number to locate the part number and price in the part number/price list.
World Trade should use the country's procedures to find the prices.
Features and devices (MESs) or specification changes (SERs) wished by the customer, must be ordered through CE management and branch office sales.
Replacement parts for features, devices and SERs, not shown in the parts manual, must also be ordered through CE management and branch office sales.

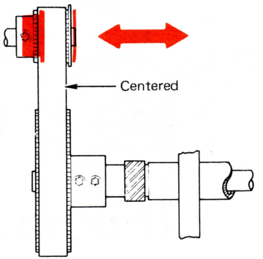
1 Drive Shaft End Play (67-10)



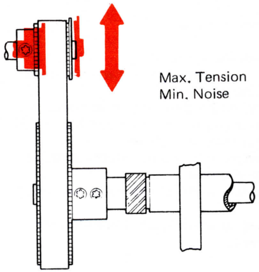
Note:
Rewind Gear Lock Screw
Must Be Tight & Lead
Sleeve Free

13

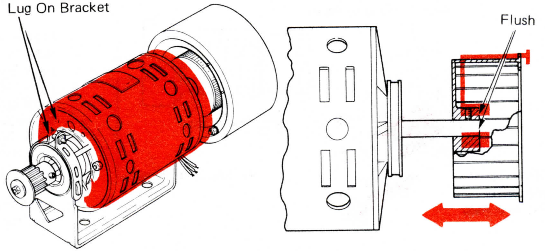
2 Belt Tracking (66-10)



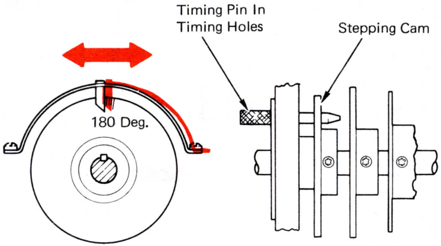
3 Belt Tension (66-57)



4 Motor And Fan (66-40) (66-11)

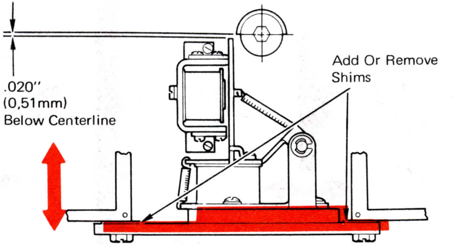


5 Pointer Bracket (69-26)



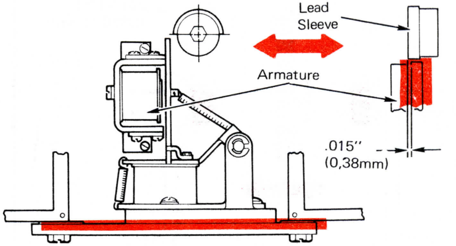
12.

6 Cycle Clutch Armature Height (68-19)

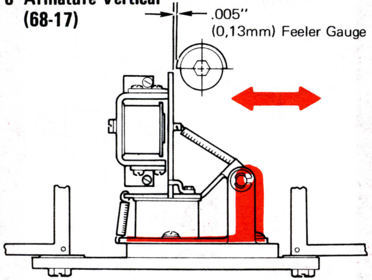


12

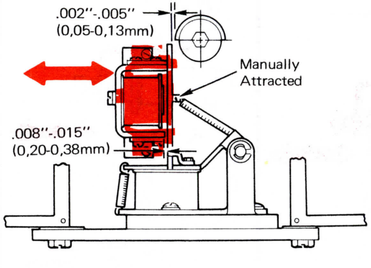
7 Armature Front-To-Rear (68-19)



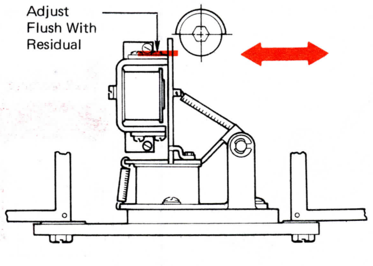
8 Armature Vertical (68-17)



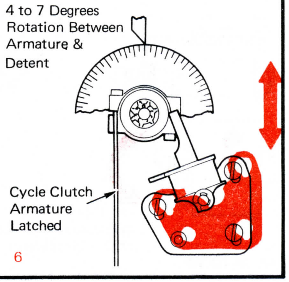
9 Cycle Clutch Magnet Position (68-30)



10 Cycle Clutch Magnet Stop (68-31)



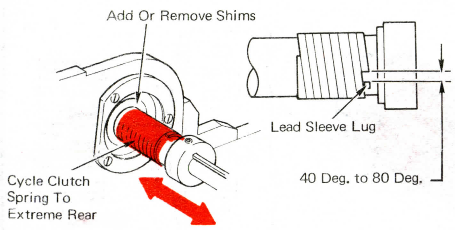
11 Backlash Detent (68-8)



6

Cycle Clutch, Rewind Shaft, Bias Clutch, Cartridge Interlock

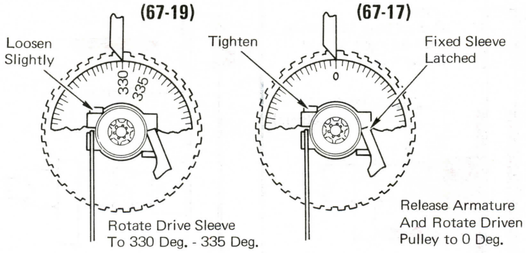
12 Lead Sleeve (67-18)



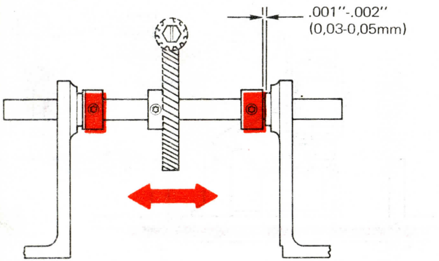
HOW TO MEASURE LEAD

1. Manually pick the armature.
2. Advance the lead sleeve fully c.c.w. to its maximum lead position.
3. Advance the entire drive sleeve assembly by turning the driven pulley c.c.w. until the lead sleeve just touches the armature.
4. With the lead sleeve just touching the armature, read the degree wheel.
5. Now rotate the driven pulley c.c.w. until slip occurs.
6. Read the degree wheel again. The difference in readings is lead.

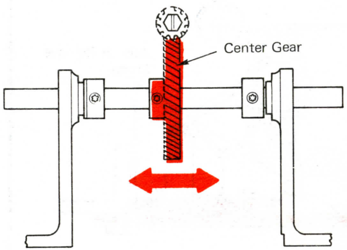
13 Cycle Clutch Spring Slip Point



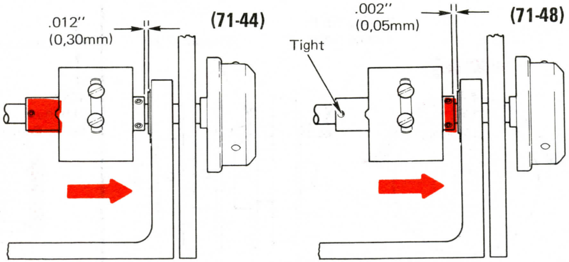
14 Rewind Shaft Position (71-19)



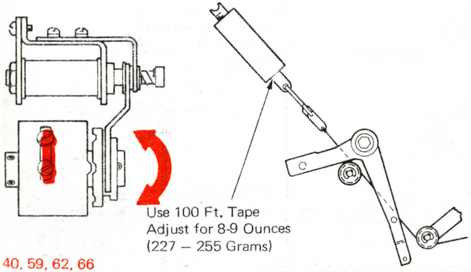
15 Helical Gear Position (71-21)



16 Bias Clutch Arbor Clearance

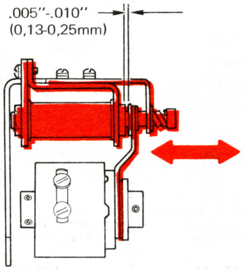


17 Low Bias (71-45)

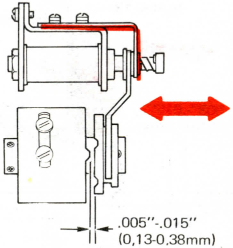


40, 59, 62, 66

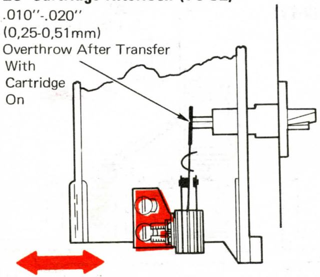
18 Bias Solenoid Position (72-11)



19 Bias Solenoid Backstop
(72-1)

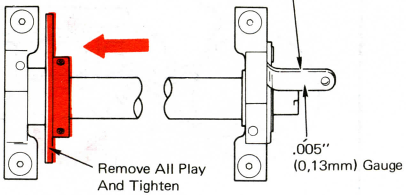


20 Cartridge Interlock (78-32)

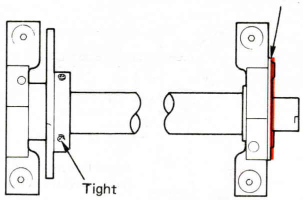


21 Drive Sleeve Pre-Load

(69-24)

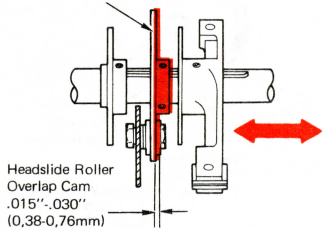


(69-2)

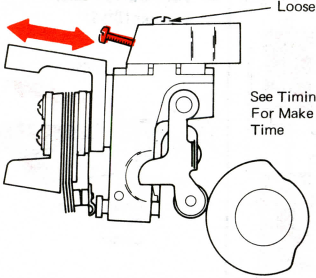


24

22 Headslide Cam (69-23)

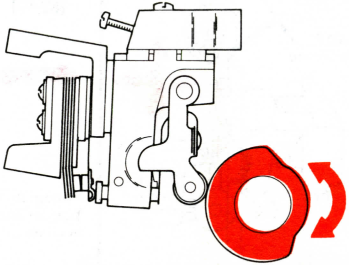


23 CB Timing (70-25)



See Timing Chart
For Make & Break
Time

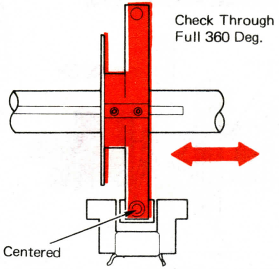
(69-7, 8, 9)



MT/ST CONTACT TIMING

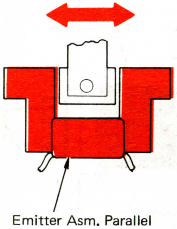
Contact	Make	Break	Name
CB 1	135	340	Char. Stored
CB 2	165	025	Relay Timing
CB 3	300	160	Record Timing
CB 4	025	245	Thy. Control
CB 5	235	025	Cycle Clutch
CB 6	220	330	Backstroke
CB 7	240	350	Stepping
CB 8	038	144	Forestroke

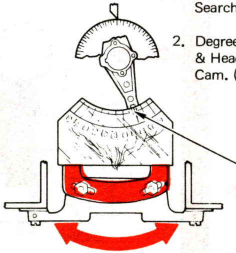
24 Emitter Arm (69-20)



25 Emitter Basket (70-1)

1. Head Position On Search Must Be Correct.
2. Degree Reading 28 Deg. & Headslide Contacting Cam. (30 Deg. on Reader)

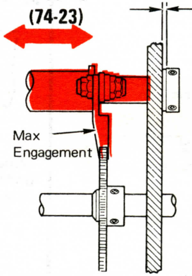




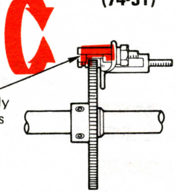
59, 64, 67, 68

26 Stepping Shaft End Play

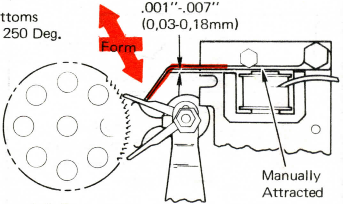
(74-23)



(74-31)



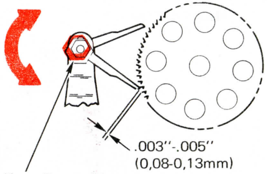
27 Stepping Magnet Armature (74-19)



Adj. Forestep
Armature In Same
Way

30

28 Forestepping Finger Eccentric (74-12)

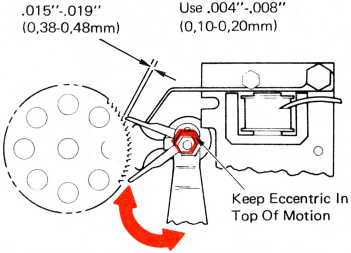


Keep Eccentric
In Bottom
Of Motion

Adjust With Degree Wheel
At 250 Deg. ± 50 Deg.
Note: "0" Cam Installed
Use .004"-.008" (0,10-0,20mm)

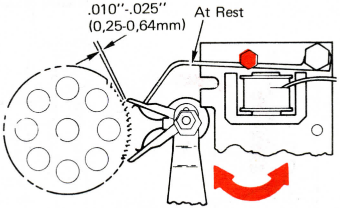
29 Backstepping Finger Eccentric (74-12)

Note: With "0" Cam Installed
Use .004"-.008"
(0,10-0,20mm)

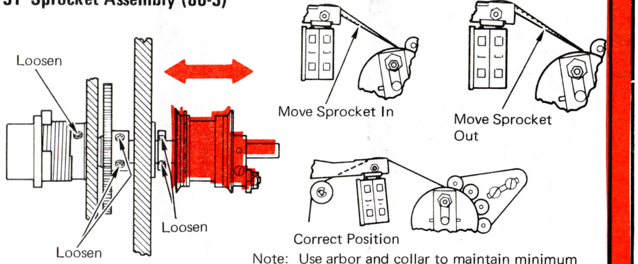


Keep Eccentric In
Top Of Motion

30 Stepping Magnet Armature Eccentric (74-21)



31 Sprocket Assembly (80-3)



Move Sprocket In

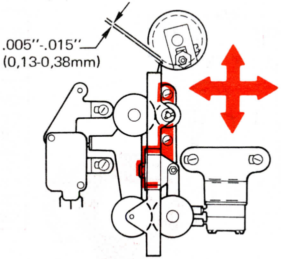
Move Sprocket
Out

Correct Position

46, 62, 64, 66, 67, 68

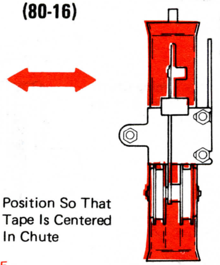
Note: Use arbor and collar to maintain minimum
endplay with no binds. Set ratchet against bearing.

32 Tape Chute (80-25)



35, 37, 69, 74

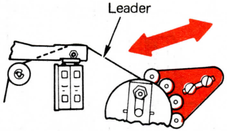
33 Tape Chute Left-To-Right (80-16)



Position So That
Tape Is Centered
In Chute

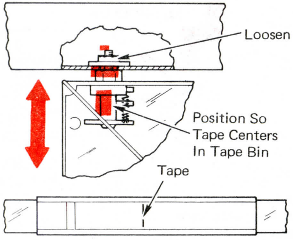
35

34 Tape Guide Roller Bracket (80-1)



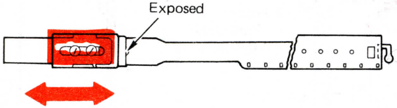
Rollers Flush
Against
Leader

35 Tape Bin Locating Stud (81-18)



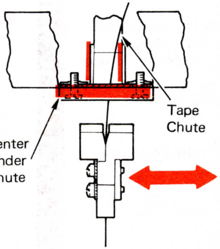
Position So
Tape Centers
In Tape Bin

36 Leader Stop (81-13)



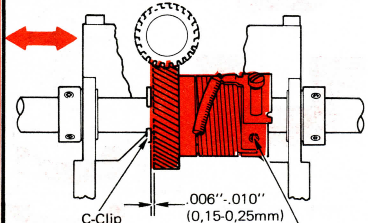
1/2 to 3/4 Of First Hole
Exposed

37 Nylon Stop (87-86)



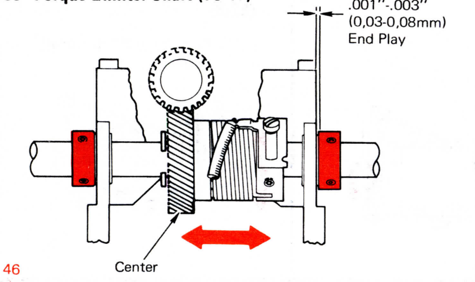
Center
Under
Chute

38 Torque Limiter Arbor (73-24)

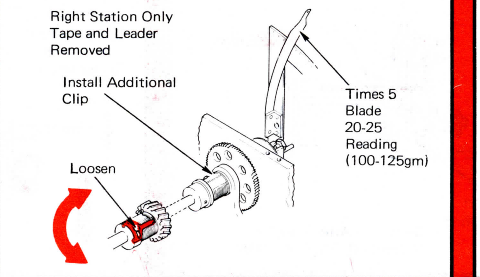


Loosen Two Screws

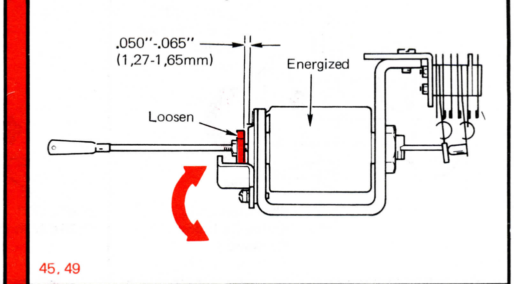
39 Torque Limiter Shaft (73-17)



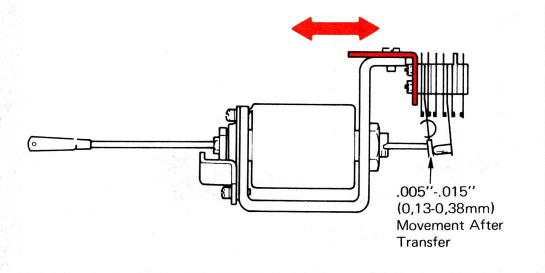
40 Torque Limiter Output (73-25)



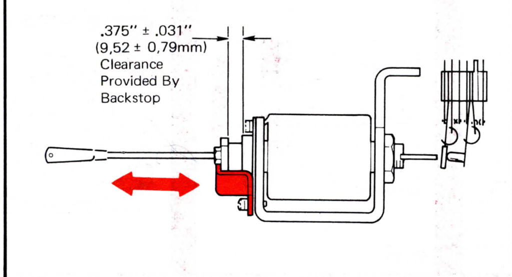
41 Detent Solenoid Plunger (76-12)



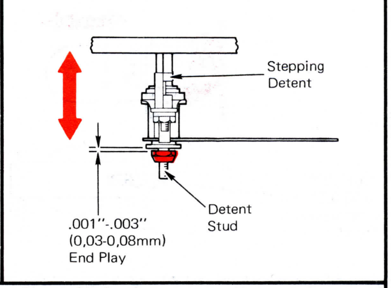
42 Detent Out Contacts (76-26)



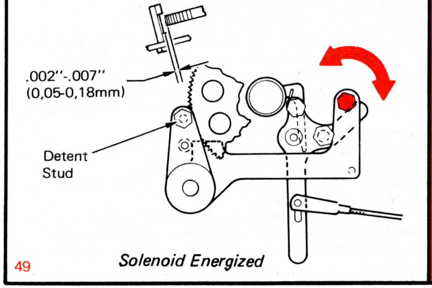
43 Detent Solenoid Backstop (76-1)



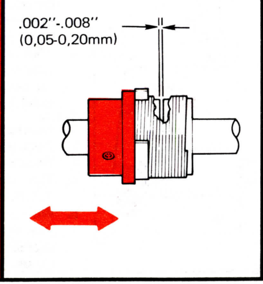
44 Detent Lever (74-3)



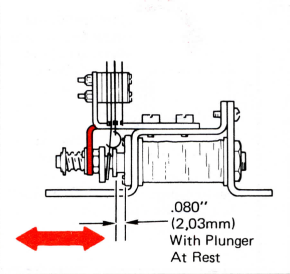
45 Detent Actuating Lever (74-1)



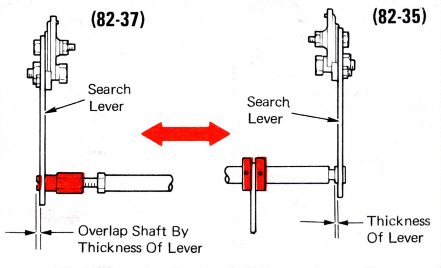
46 Search Arbors (73-16)



47 Search Solenoid Backstop (82-40)

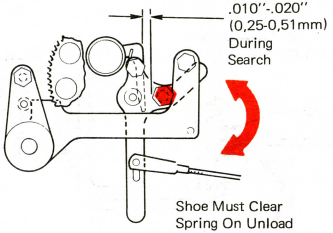


48 Load Search Shaft

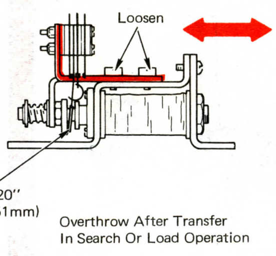


Tape Drive (Search), Search Position Magnet, Headslide Bearing, Station Platform, Tape Support

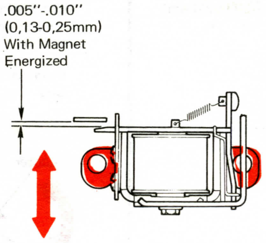
49 Search Shoe Clearance (76-22)



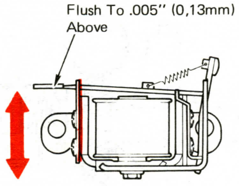
50 Load Search Contacts (82-41)



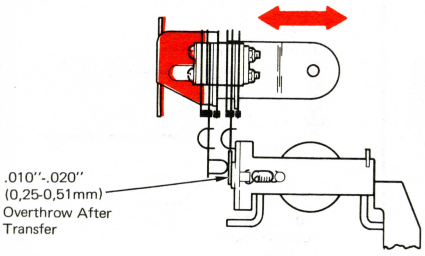
51 Search Position Magnet (82-13)



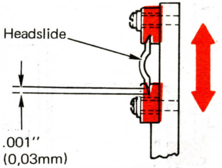
52 Search Position Magnet Upstop (82-3)



53 Search Position Magnet Contacts (82-18)

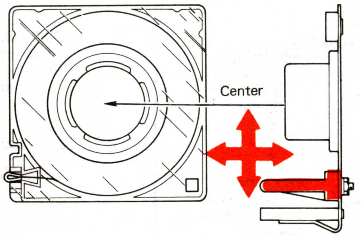


54 Headslide Bearings (77-2)

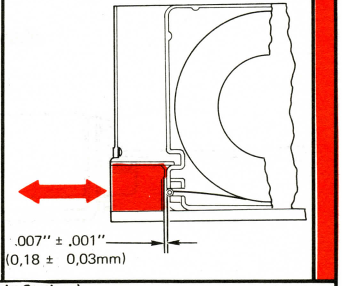


52, 59

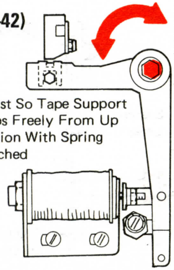
55 Cartridge Locator Pin (78-25)



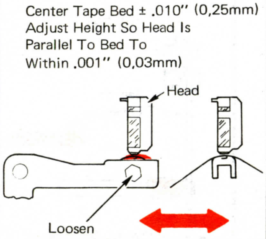
56 Station Block (78-12)



57 Tape Support Pivot (79-42)

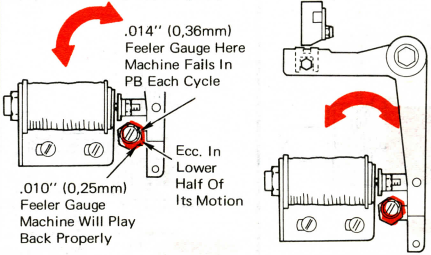


58 Tape Bed (79-2)



62, 64, 66, 67

59 Head To Tape (79-43)



71

MT READER (Left and Right Stations)

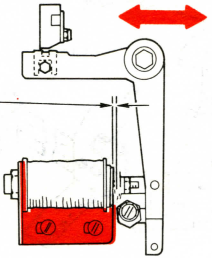
1. Install the "input from tape reader/output to lights" program steps described in the head alignment section for the MT Reader.
2. Position an uppercase "N" (1-5-8) under the head.
3. Turn on the head alignment switch in the MT Reader (continuous run).
4. With a .010'' (0,25mm) feeler gauge inserted between the tape support arm stop and the tape support eccentric stop, the 4-16-64 bit position lights should glow steadily. (New method—keybuttons 8-6-4.) With a .014'' (0,36mm) feeler gauge you should have no lights.

T.T.R.

1. Position an uppercase "N" under the head (1-5-8).
2. Place the EOT release switch in the record position.
3. Place the CE aid switch in the continuous run position.
4. The console will now "free run" and the lights will steadily glow. T.T.R. (ready = 1 bit – EOT = 8 bit).
5. With a .010'' (0,25mm) feeler gauge between the tape support arm stop and the tape support eccentric stop, the error and ready light should glow steadily. With a .014'' (0,36mm) feeler gauge you should have no lights.

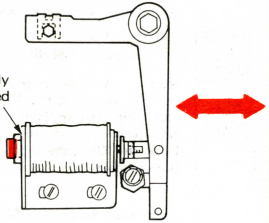
60 Tape Support Solenoid (79-9)

.005"-.010"
(0,13-0,25mm)
With Solenoid
Energized



61 Tape Support Solenoid Core (79-55)

Manually
Operated

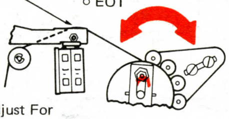


Plunger Attracted – Adjust Core Until It
Contacts Plunger – Backoff 1/2 Turn

62 Sprocket Adjustment (80-5)
(Along The Tape)

Sprocket Hole Under
Head Gap

○ Ready
○ EOT



MT/ST – Adjust For
Continuous 1 & 8 Bit
Or No Bits With Good
Tape

● Error
○ On
● Ready

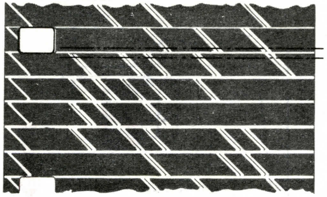
For TTR

Section "A" of Master Tape
Adj. sprocket for:
1. Both lights
2. No lights (With good tape and TTR at sprocket hole)

MT/SR

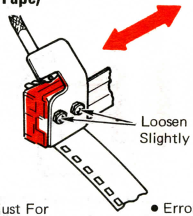
Section "A" of Master Tape
Adj. sprocket for error light
and ready light

63 Along The Tape (Comparator)



Note: After developing a magnetic tape. Remove the developer before winding the tape back into the cartridge. Failure to do so can cause machine problems.

64 Head Alignment (77-10)
(Across The Tape)



Loosen
Slightly

MT/ST – Adjust For
Continuous 1 Bit

● Error
○ On
● Ready

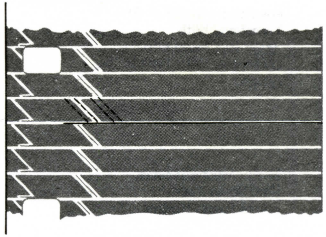
TTR

Section "B" of Master Tape
Adj. head for no lights except
"c" light next to CE Aid Switch

MT/SR

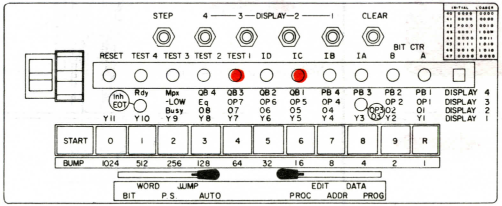
Section "B" of Master Tape
Adj. head for error light and
ready light

65 Across The Tape
(Comparator)



66 Head Alignment "Along" (80-5)

TTR – Head Alignment check
7 bit in reference code
with comparator



CONTROL PANEL – C E CONTROLS

Section "A" Of Master Tape

Adj. Sprocket Eccentric
For Continuous 16 & 64 Bit

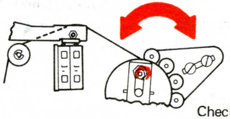
BYTE	KEY
0	7
1	67R
2	37
3	69R
4	0
5	0

Note: Address Byte 0 To Process

Third Tape Recorder – Along
"Ready" And E.O.T. Light "On"
"C" Light "Off".

NOTE: Continuous No Bit (With Good Tapes & Reading At Sprocket Hole) Is Acceptable

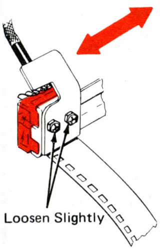
To Align Left Station Change Byte 1 Data To 678R

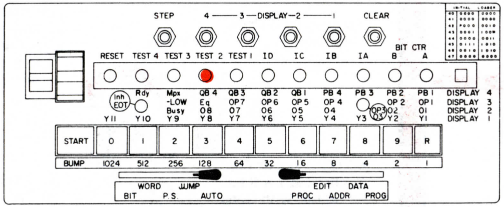


"C" Light Is Next To CE Aid Switch

Check Alignment With Sprocket
Turn To This Position Against Bias

67 Head Alignment "Across" (77-10)





CONTROL PANEL – C E CONTROLS

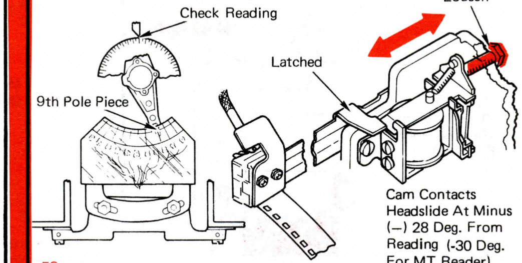
Section "B" Of Master Tape

Adj. Head For
Continuous 128 Bit

Note: Machine tolerances may be such that the 128, 4 and 1 bit position lights occur simultaneously. If all three lights are "ON", the alignment is acceptable.

Third Tape Recorder – Along "Ready" And EOT Light "On" "C" Light "Off"

68 Head Position On Search (82-49)

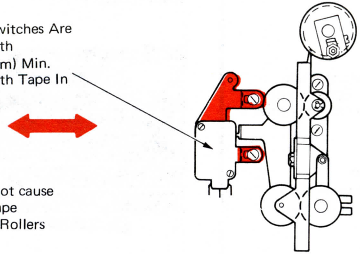


Cam Contacts Headslide At Minus (–) 28 Deg. From Reading (-30 Deg. For MT Reader)

53

69 Rewind Switch Position (80-10)

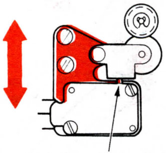
Position So Switches Are Transfered With .005" (0,13mm) Min. Overthrow With Tape In Chute



Note: Must not cause Bind When Tape Eyelet Passes Rollers

32

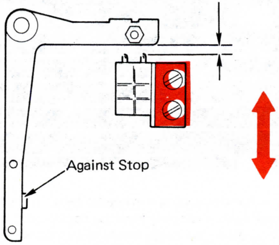
70 End Of Tape (79-29)



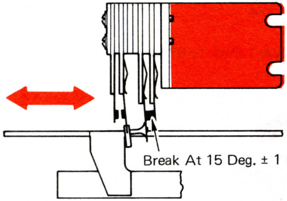
With Tape Under Roller Position For .015"-.025" (0,38-0,64mm) Overthrow After Transfer

71 Tape Support Switches (79-47)

.002"-.010"
(0,05-0,25mm)



72 Home Position Contact (77-33)

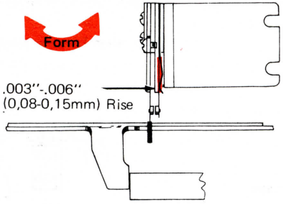


Break At 15 Deg. ± 1 Deg.

NOTE: Both TTR N/O Contacts Make
At 340 Deg. + 0 Deg. - 5 Deg.

(MT/ST Machine At Rest)

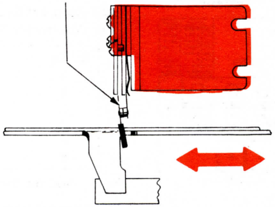
(77-34)



.003"-.006"
(0,08-0,15mm) Rise

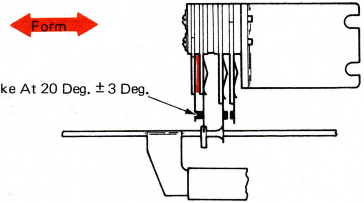
(77-33)

Break At 20 Deg. ± 5 Deg.
Remake At 340 Deg. ± 5 Deg.



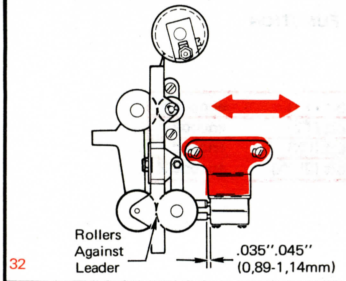
(MT/ST Reader)

73 Home Position Contact (77-34)

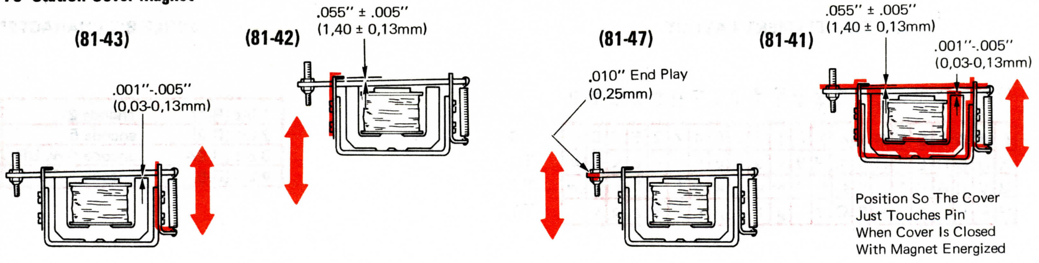


Make At 20 Deg. ± 3 Deg.

74 Leader Sense Switches (80-31)

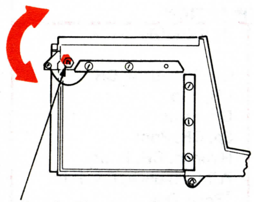


75 Station Cover Magnet



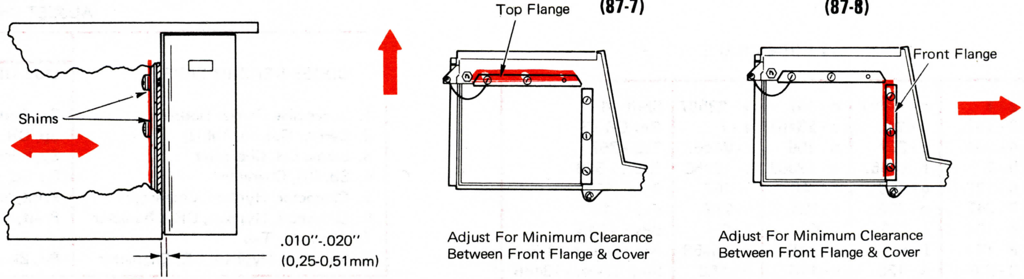
Position So The Cover Just Touches Pin When Cover Is Closed With Magnet Energized

76 Tape Station Cover Adjusting Nut (81-3)



Adjust So That Lock Pin Enters The Slot In The Cover

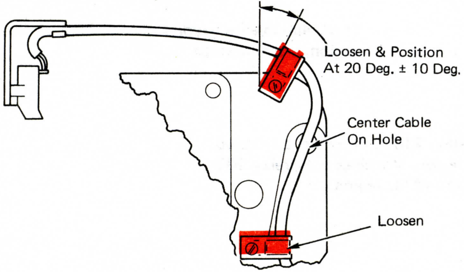
77 Tape Station Cover



Adjust For Minimum Clearance Between Front Flange & Cover

Adjust For Minimum Clearance Between Front Flange & Cover

78 Head Cable Clamps (77-15)



Loosen & Position At 20 Deg. ± 10 Deg.

Center Cable On Hole

Loosen

MT/ST TYPE ELEMENT LAYOUT

-5	-4	-3	-2	-1	H	+1	+2	+3	+4	+5	-5	-4	-3	-2	-1	H	+1	+2	+3	+4	+5	
[	#	&	*	$	Z	@	%	c	)	(	]	3	7	8	4	z	2	5	6	0	9	T-0
X	U	D	C	L	T	N	E	K	H	B	x	u	d	c	l	t	n	e	k	h	b	T-1
M	V	R	A	O	°	.	”	I	S	W	m	v	r	a	o	!	.	’	i	s	w	T-2
G	F	:	,	?	J	+	P	Q	Y	—	g	f	;	,	/	j	=	p	q	y	-	T-1,2

SINGLE BIT CHARACTER OR FUNCTION

1 bit (R-1)	-	encode 2	5 bit (T1)	-	encode t
2 bit (R-2)	-	encode 5	6 bit (T2)	-	encode !
3 bit (R-2A)	-	encode Rev. CR	7 bit (Ck)	-	encode z
4 bit (R-5)	-	encode]	8 bit (Shift)	-	encode Z

BIT CODE CHART

2 - 1	c - 12457	n - 157	y - 23567	Shift - 8
3 - 147	d - 245	o - 23467	z - 7	Rev CR - 3
4 - 234	e - 257	p - 256	; - 24567	Tab - 367
5 - 2	f - 14567	q - 12567	, - 12456	Space - 356
6 - 127	g - 456	r - 246	. - 167	Stop - 134
7 - 247	h - 235	s - 236	’ - 267	Feed - 135
8 - 124	i - 126	t - 5	! - 6	Bksp. - 346
9 - 123	j - 567	u - 145	/ - 23456	Auto Search - 136
0 - 237	k - 125	v - 146	= - 156	Stop Trans. - 13456
a - 12467	l - 23457	w - 12367	- - 12356	Switch - 137
b - 12357	m - 467	x - 457	[- 4	Prog. Search - 13467
				Red Ribbon - 34567
				Adj. - 13567

NOTE: For upper case characters, add an 8 bit in every case and add or delete a 7 bit for odd bit parity, i.e., a is 12467, g is 456, A is 12468, G is 45678.

ADJUST CHART

CODES READ IN TAPE	TYPEWRITER ACTION	
	OUT OF REGION	IN REGION
1. Successive Carrier Returns	Sp, Repetitive CR	CR, Repetitive CR
2. Carrier Return, Tab(s)	Sp, CR, Tab	CR, Tab
3. Single CR, Character	Sp, Print	CR, Print
4. Sp. CR, Character	Sp, Sp, Print	Sp, CR, Print
5. Character, Hyphen, Character	Print, Hyphen, Print	Hyphen, CR, Print
6. Character, Hyphen, CR, Character	Print, Hyphen, Print	Print, Hyphen, CR, Print
7. Character Tab		*Print Tab
8. Sp, Bksp, Hyphen, CR, Character	Sp, Bksp, Print	Sp, Bksp, Hyphen, CR, Print

NOTE: *If tabulation ends beyond region, machine stops.

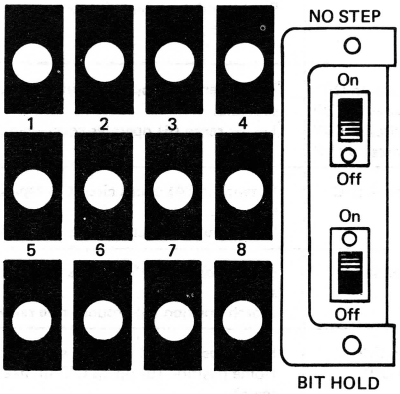
NOTE: Machines with relay 213 will print successive hyphens in or out of the region. Machines with relay 203 will print one hyphen only out of the region.

CE AIDS

A. No step switch – opens the ground circuit for the stepping magnets, thereby inhibiting incremental tape drive.

B. Bit hold switch – provides a hold for the character stored relay 76 (through its pick circuit) if playback error occurs.

C. CE bit lights – indicate thyratron fires, thereby indicating the bit in the bit relay register.



BIT LIGHTS

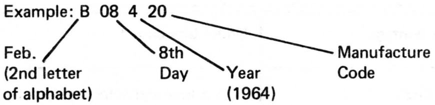
+12 volt fuse – if this fuse blows – .4 volts will be present on the head read coil. This could cause erasure of the search codes or of a single character.

-12 volt fuse – this fuse blown will cause all bit thyratrons to fire every time the console is cycled.

Bit hold switch – if the bit hold switch is in the ON position, the machine will not read reference codes on old level machines below 83153.

MT/ST TAPES

The tapes have been coded as follows:



Tape life is affected primarily by the following:

1. Torque limiter adjustment.
2. Bias adjustment.
3. Binds, tape guides, rollers, etc.
4. Handling techniques.
5. Customer usage.

TAPE STORAGE

Tapes may be stored in the following environment:

Temperature Range	Maximum Humiditiy
40 Deg. – 90 Deg. F	20 – 80%

NAME	LOCATION	IDENTIFICATION	PURPOSE
Reel interlock contact	Under bias clutch	N/A	Prevents detents from being removed when no tape cartridge is present
End of tape switch	To the rear and below tape station block	EOT (R) A 2 brown wires on O/P EOT (R) B 2 white wires on O/P EOT (L) A 1 wire on O/P, N/C, N/O EOT (L) B 1 wire on O/P, N/O	Interlock console when end of tape is reached. Picks record error and opens circuits to detent.
Tape support (pressure pad) switch	Between tape support and tape support solenoid.	P/P A 2 brown wires on N/C P/P (R) B 1 brown wire on N/C P/P (L) A 1 brown wire on O/P P/P (L) B 2 brown wires on O/P	P/P (A) opens stepping circuit P/P (B) indicates tape support is up.
Leader sense switch	On outside of power frame just to the front of the tape chute.	LEADER SENSE (R) A 2 white wires on O/P LEADER SENSE (R) B 2 brown wires on O/P LEADER SENSE (L) A 1 brown wires on O/P LEADER SENSE (L) B 2 brown wires on O/P	Leader sense (A) opens circuit to tape support solenoid. Leader sense (B) operates cover unlock.
Detent out contact	Just in front of each detent solenoid	DETENT OUT (L&R) black wire on A N/C	Detent out (A) opens circuit to tape support solenoid. Detent out (B) opens circuit to transmit contacts.
Search position	Just in front and right of the search position magnet	SEARCH POSITION A is on the inside	Search position (A) operates detent solenoid in search. Search position (B) grounds ring relays in search.
Home position contact	Just to the rear of the head slide	HOME POSITION A 2 wires on the O/P HOME POSITION B 1 wire on the O/P	Home position (A) operates search position solenoid. Home position (B) opens C/C till head restores in search.
Load search solenoid contacts	Just to the right of the left detent mounting stud.	N/A	Completes circuit to detent solenoid during load and forward search.
Circuit breakers (CB)	To the upper left of the drive sleeve.	Numbered front to rear 1 thru 8	Provide gating for relays and electronics
Rewind sense switch	On outside of power frame to the rear of tape chute.	N/A	Picks and holds relays 121 and 107 while the roller is in the rewind slot.

RELAYS AND ELECTRONICS (MECH. 84)

48-VOLT LOOP DIAGNOSTICS

A procedure that may be used to diagnose the cause of a blown 48-volt fuse is to systematically break the 48-volt loop to determine the circuit that is shorted.

There may be a slight variation from this loop on older machines. This should be used as a guide and is not an exact wiring breakout on all machines.

STEP 1

Disconnect the I/O plug in the I/O. (This will isolate the I/O from the circuit.)

STEP 2

Disconnect the cable wire in 234-11 O/P. (This will eliminate the double input to the loop. In some cases you can hook an ohmmeter to this lead and read the short to the ground; if so, you can look for the short in this manner and not blow fuses under power.)

Note: Turn the machine off and remove the fuse before taking a meter reading.

STEP 3

Disconnect the wire in RC 15-9C. (This will isolate the control panel mode switches from the circuit.)

STEP 4

Disconnect the cable wire in 63-1 O/P. (This will isolate the gate from the circuit.) The 48-volts are now applied only to the tape deck.

At this point if the fuse does not blow, the short is in the relay gate. If so, reinsert the wire into 63-1 O/P and follow the cable loop disconnecting cable wires until the short is isolated to a particular row. Then follow the row jumper list to isolate the short to a point or particular circuit input.

ROW 3

From	To
63-1 O/P	65-6 O/P
65-6 O/P	68-4 O/P
68-4 O/P	70-1 O/P
70-1 O/P	73-1 O/P
73-1 O/P	76-2 O/P
76-2 O/P	76-8 O/P
76-8 O/P	76-10 O/P
76-10 O/P	79-7 O/P
79-7 O/P	82-2 O/P
82-2 O/P	87-5 O/P
87-5 O/P	87-8 O/P
87-8 O/P	90-5 O/P
90-5 O/P	90-7 O/P

ROW 4

From	To
103-1 O/P	107-5 O/P
107-5 O/P	109-2 O/P
109-2 O/P	110-4 O/P
110-4 O/P	112-8 O/P
112-8 O/P	112-9 O/P
112-9 O/P	112-10 O/P
112-10 O/P	116-2 O/P

ROW 6

From	To
158-6 N/O	161-6 N/O
161-6 N/O	161-9 N/C
161-9 N/C	164-7 N/C
164-7 N/C	164-12 N/O
167-1 O/P	170-2 O/P
170-2 O/P	173-5 N/O
173-5 N/O	176-6 N/O
176-6 N/O	180-6 N/C
180-6 N/C	183-3 N/C
183-3 N/C	183-4 N/O

PANEL

From	To
SW-4-A O/P	SW-4-c O/P

TAPE DECK

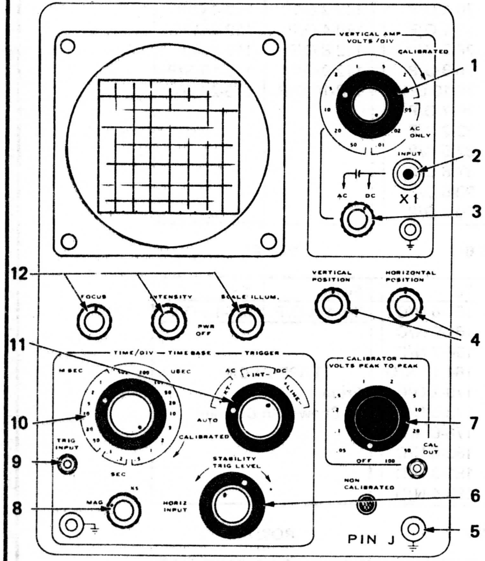
From	To
As Shown On Diagram	

ROW 7

From	To
201-1 O/P	214-1 O/P

ROW 8

From	To
234 -2 O/P	234-9 N/C
234-9 N/C	234-11 O/P



1. Volts Per Division Dial
   - a. Set inside dial fully clockwise.
   - b. Set outside dial at vertical volts deflection required.

2. Scope Probe Input
   Use a X1 probe.

3. Scope Input Dial
   Set at DC.

4. Vertical & Horizontal Position
   Set these dials to position the signal trace at the desired position on the screen.

5. Ground Connector
   Connect this to the pin J buss bar.

6. Stability Dial With All Dials And Connections Set (Sync.)
   - a. Turn both dials fully clockwise.
   - b. Start machine cycling.
   - c. Turn inside dial counterclockwise till signal just disappears.
   - d. Turn outside dial counterclockwise till signal just appears.

7. Calibrator
   Turn dial to off (for using this dial refer to scope operator manual).

8. Magnification Dial (Time)
   Set at X1.

9. Trigger Input Connection
   Inductively couple to trigger required.
   (Do not connect 48V directly to ext. trigger input.)

10. Time Per Division Dial
    - a. Set inside dial fully clockwise.
    - b. Set outside dial at required time sweep (an MT/ST cycle is 50 milliseconds).

11. Trigger Input Dial
    - a. Set inside dial at DC.
    - b. Set outside dial at + ext.

12. Focus – Intensity – Scale Illumination
    Set these three dials for the sharpest signal.

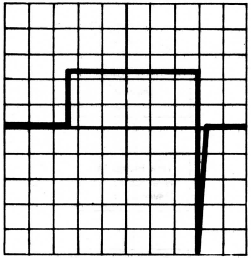
These are the most common settings; however, there may be cases where these settings must be changed. For example, the trigger input (9) may be set to – ext. or internal triggering.

When scoping the CBs, the things to look for are:

- A. Bouncing CBs – This will show up as a break in the trace.
- B. Excessive Negative Spikes – A spike exceeding 275 volts can cause a problem with the bit relays.
- C. CB Time and Duration.

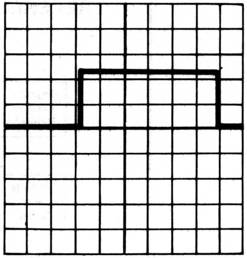
When scoping the electronics, the signal should appear as indicated by the signal number on that point. Most electronic signals can be seen by triggering on CB-8 and setting the time/div. dial at X5. The volts/div. dial should be set for the most readable signal. When reading the output from the read head, a lower sweep setting will be necessary.

WAVE SHAPES



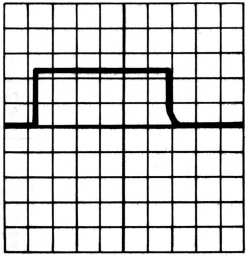
CB-1

Settings
1-20 volts/div.
9-CB-8
10-X5 milliseconds
SKIP MODE



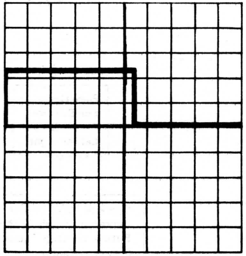
CB-2

Settings
2-20 volts/div.
9-CB-8
10-X5 milliseconds
SKIP MODE



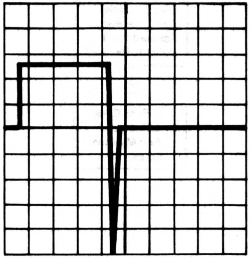
CB-3

Settings
1-20 volts/div.
9-CB-6
10-X5 milliseconds
SKIP MODE



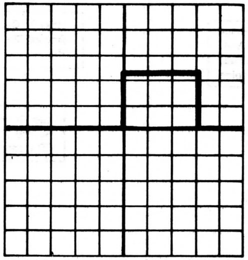
CB-4

Settings
1-20 volts/div.
9-CB-4
10-X5 milliseconds
SKIP MODE
O/P disconnected



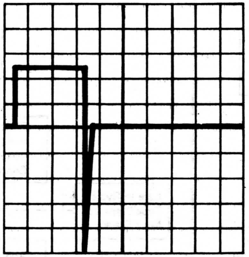
CB-5

Settings
1-20 volts/div.
9-CB-6
10-X5 milliseconds
SKIP MODE



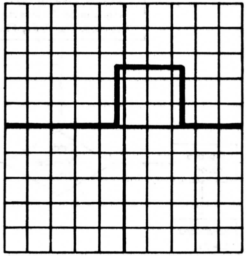
CB-6

Settings
1-20 volts/div.
9-CB-8
10-X5 milliseconds
SKIP MODE



CB-7

Settings
1-20 volts/div.
9-CB-6
10-X5 milliseconds
SKIP MODE (not in no-step)

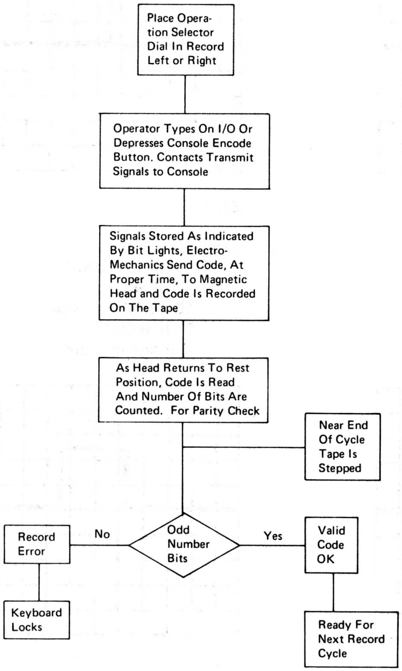


CB-8

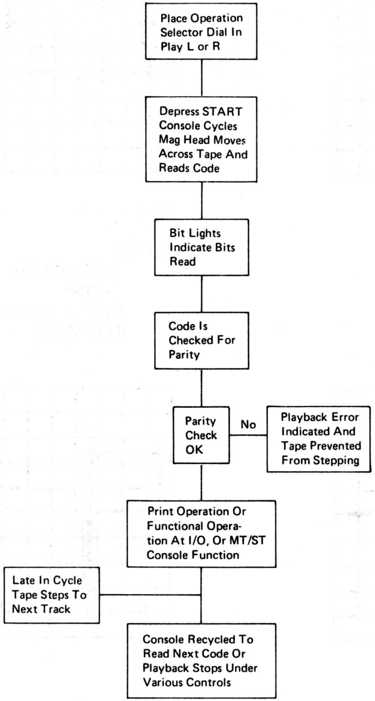
Settings
1-20 volts/div.
9-CB-6
10-X5 milliseconds
SKIP MODE

Record, Playback, Record Reference, Rewind

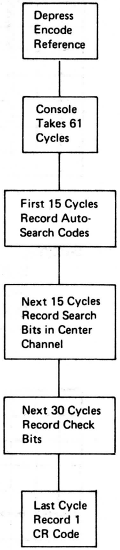
RECORD


Place Operation Selector Dial In Record Left or Right
Operator Types On I/O Or Depresses Console Encode Button. Contacts Transmit Signals to Console
Signals Stored As Indicated By Bit Lights, Electro-Mechanics Send Code, At Proper Time, To Magnetic Head and Code Is Recorded On The Tape
As Head Returns To Rest Position, Code Is Read And Number Of Bits Are Counted. For Parity Check
Near End Of Cycle Tape Is Stepped
Odd Number Bits
No
Record Error
Keyboard Locks
Yes
Valid Code OK
Ready For Next Record Cycle

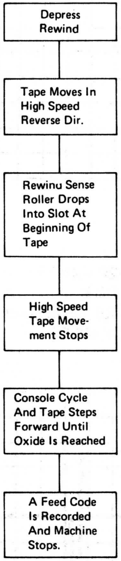
PLAYBACK

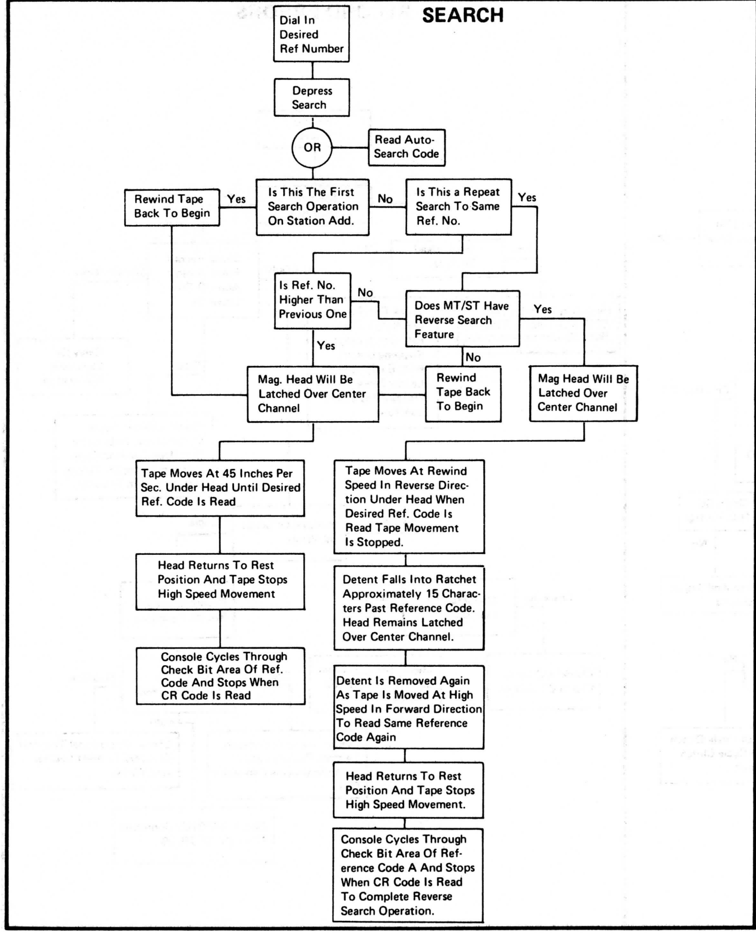

Place Operation Selector Dial In Play L or R
Depress START Console Cycles Mag Head Moves Across Tape And Reads Code
Bit Lights Indicate Bits Read
Code Is Checked For Parity
Parity Check OK
No
Playback Error Indicated And Tape Prevented From Stepping
Print Operation Or Functional Operation At I/O, Or MT/ST Console Function
Late In Cycle Tape Steps To Next Track
Console Recycled To Read Next Code Or Playback Stops Under Various Controls

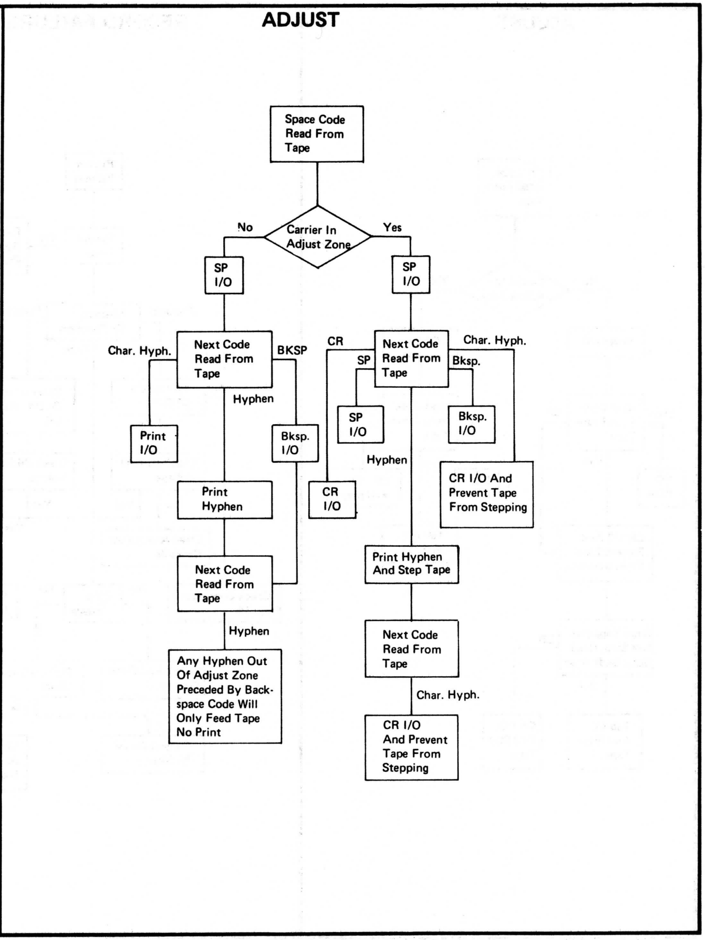
RECORD REFERENCE


Depress Encode Reference
Console Takes 61 Cycles
First 15 Cycles Record Auto-Search Codes
Next 15 Cycles Record Search Bits in Center Channel
Next 30 Cycles Record Check Bits
Last Cycle Record 1 CR Code

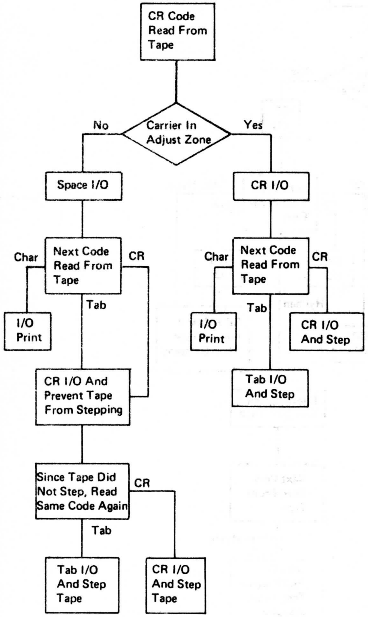
REWIND


Depress Rewind
Tape Moves In High Speed Reverse Dir.
Rewind Sense Roller Drops Into Slot At Beginning Of Tape
High Speed Tape Movement Stops
Console Cycle And Tape Steps Forward Until Oxide Is Reached
A Feed Code Is Recorded And Machine Stops.

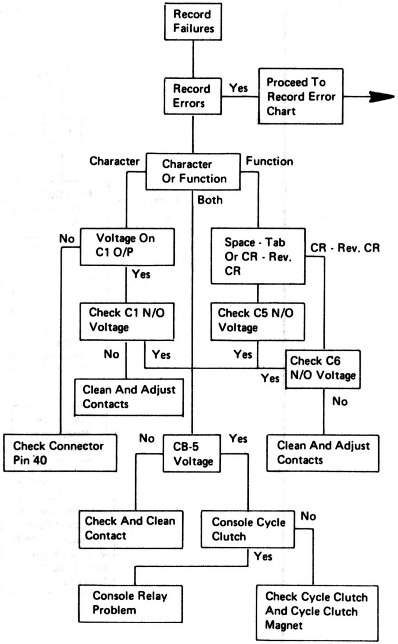

SEARCH
Dial In Desired Ref Number
Depress Search
OR
Read Auto-Search Code
Rewind Tape Back To Begin
Yes
Is This The First Search Operation On Station Add.
No
Is This a Repeat Search To Same Ref. No.
Yes
Is Ref. No. Higher Than Previous One
No
Does MT/ST Have Reverse Search Feature
Yes
Yes
No
Mag. Head Will Be Latched Over Center Channel
Rewind Tape Back To Begin
Mag Head Will Be Latched Over Center Channel
Tape Moves At 45 Inches Per Sec. Under Head Until Desired Ref. Code Is Read
Head Returns To Rest Position And Tape Stops High Speed Movement
Console Cycles Through Check Bit Area Of Ref. Code And Stops When CR Code Is Read
Tape Moves At Rewind Speed In Reverse Direction Under Head When Desired Ref. Code Is Read Tape Movement Is Stopped.
Detent Falls Into Ratchet Approximately 15 Characters Past Reference Code. Head Remains Latched Over Center Channel.
Detent Is Removed Again As Tape Is Moved At High Speed In Forward Direction To Read Same Reference Code Again
Head Returns To Rest Position And Tape Stops High Speed Movement.
Console Cycles Through Check Bit Area Of Reference Code A And Stops When CR Code Is Read To Complete Reverse Search Operation.


ADJUST

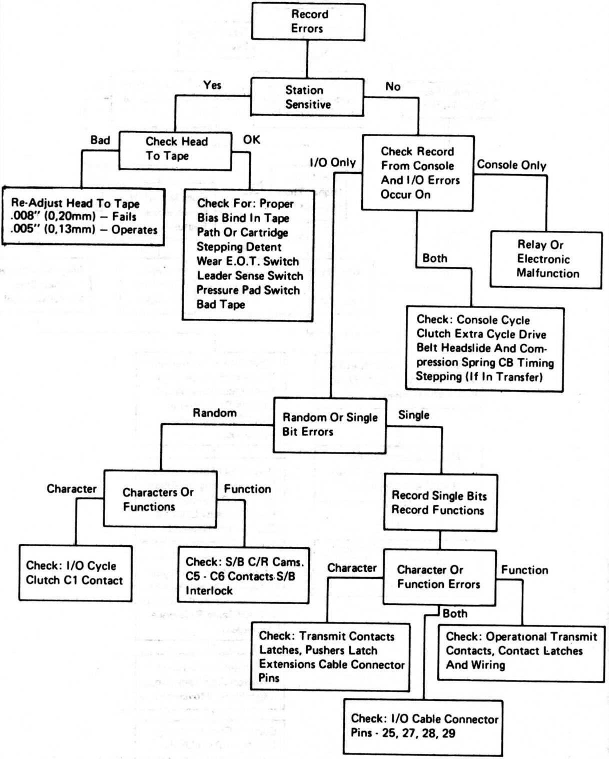
ADJUST



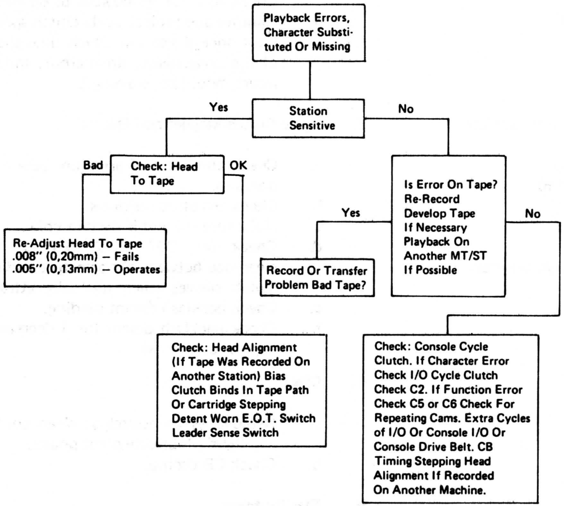
RECORD FAILURES



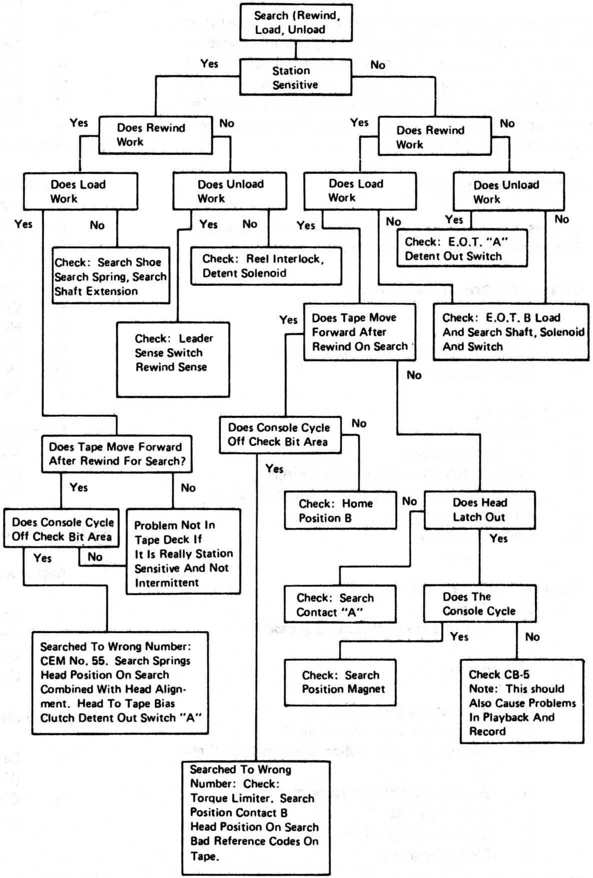
RECORD ERRORS


Record Errors
Yes
Station Sensitive
No
Bad
Check Head To Tape
OK
Re-Adjust Head To Tape
.008" (0,20mm) – Fails
.005" (0,13mm) – Operates
Check For: Proper Bias Bind In Tape Path Or Cartridge Stepping Detent Wear E.O.T. Switch Leader Sense Switch Pressure Pad Switch Bad Tape
I/O Only
Check Record From Console And I/O Errors Occur On
Console Only
Relay Or Electronic Malfunction
Both
Check: Console Cycle Clutch Extra Cycle Drive Belt Headslide And Compression Spring CB Timing Stepping (If In Transfer)
Random
Random Or Single Bit Errors
Single
Character
Characters Or Functions
Function
Check: I/O Cycle Clutch C1 Contact
Check: S/B C/R Cams. C5 - C6 Contacts S/B Interlock
Record Single Bits Record Functions
Character
Character Or Function Errors
Function
Both
Check: Transmit Contacts Latches, Pushers Latch Extensions Cable Connector Pins
Check: Operational Transmit Contacts, Contact Latches And Wiring
Check: I/O Cable Connector Pins - 25, 27, 28, 29

PLAYBACK ERRORS


Playback Errors, Character Substituted Or Missing
Station Sensitive
Yes
No
Check: Head To Tape
Bad
OK
Re-Adjust Head To Tape .008" (0,20mm) – Fails .005" (0,13mm) – Operates
Check: Head Alignment (If Tape Was Recorded On Another Station) Bias Clutch Binds In Tape Path Or Cartridge Stepping Detent Worn E.O.T. Switch Leader Sense Switch
Is Error On Tape? Re-Record Develop Tape If Necessary Playback On Another MT/ST If Possible
Yes
No
Record Or Transfer Problem Bad Tape?
Check: Console Cycle Clutch. If Character Error Check I/O Cycle Clutch Check C2. If Function Error Check C5 or C6 Check For Repeating Cams. Extra Cycles of I/O Or Console I/O Or Console Drive Belt. CB Timing Stepping Head Alignment If Recorded On Another Machine.

SEARCH FAILURES


Search (Rewind, Load, Unload
Station Sensitive
Yes
No
Does Rewind Work
Yes
No
Does Load Work
Yes
No
Check: Search Shoe Search Spring, Search Shaft Extension
Does Unload Work
Yes
No
Check: Reel Interlock, Detent Solenoid
Check: Leader Sense Switch Rewind Sense
Does Tape Move Forward After Rewind For Search?
Yes
No
Does Console Cycle Off Check Bit Area
Yes
No
Problem Not In Tape Deck If It Is Really Station Sensitive And Not Intermittent
Searched To Wrong Number: CEM No. 55. Search Springs Head Position On Search Combined With Head Alignment. Head To Tape Bias Clutch Detent Out Switch "A"
Does Rewind Work
Yes
No
Does Load Work
Yes
No
Does Unload Work
Yes
No
Check: E.O.T. "A" Detent Out Switch
Check: E.O.T. B Load And Search Shaft, Solenoid And Switch
Does Tape Move Forward After Rewind On Search
Yes
No
Does Console Cycle Off Check Bit Area
Yes
No
Check: Home Position B
No
Does Head Latch Out
Yes
Check: Search Contact "A"
Does The Console Cycle
Yes
No
Check: Search Position Magnet
Check CB-5 Note: This should Also Cause Problems In Playback And Record
Searched To Wrong Number: Check: Torque Limiter. Search Position Contact B Head Position On Search Bad Reference Codes On Tape.

PREVENTIVE MAINTENANCE

The following information is printed to assist the customer engineer in developing a meaningful inspection procedure for a particular machine. It is not intended that the areas outlined below be the only areas to which the CE's attention be directed. Each machine installation will differ slightly in application and environment. This procedure is to be used only as a guide.

INSPECTION PROCEDURE

A. Discuss the machine performance with the operator. Repair any existing problems on the system.

B. Clean and lubricate the printer.

No. 10 Oil
1. All bearings, rollers and pivot points
2. Motor (once a year)

No. 23 Grease
1. All cam surfaces
2. All sliding surfaces
3. Cycle clutch and shift clutch springs
4. Upper and lower ball sockets and ball joints
5. All latching surfaces
6. Feed roll pivots

C. Clean and lubricate the tape deck
- I. Every Cycle
  - A. Console cycle clutch 23 grease

- II. As Required
  No. 10 Oil
  - A. Backlash detent pivot
  - B. Cycle clutch armature pivot
  - C. Circuit breaker roller pivot points (lightly)
  - D. Search magnet armature pivot
  - E. Detent pivots
  - F. Search springs (light film)
  - G. Motor bearings
  - H. Drive sleeve rear bearing
  - I. Head slide bearings
  - J. Stepping pawl pivots
  - K. Sprocket guide rollers
  - L. Tape support pivot
  - M. Rewind sensing arm pivot
  - N. Buffer arm pivot
  - O. Guide rollers

  Any Areas Where Rust Is Apparent

- III. No. 23 Grease
  - A. Bias clutch
  - B. Rewind shaft gear
  - C. Search magnet armature top surface (lightly)
  - D. Head slide compression spring
  - E. Circuit breaker cams (light film)
  - F. Helical gear
  - G. Stepping cam
  - H. Head slide cam
  - I. Torque limiter spring (through setscrew)

- IV. Molykote®
  - A. Bias clutch dog plate
  - B. Bias lever fork
  - C. Stepping ratchet

D. Perform the following checks:

1. **Motor and Drive**

   a. Check drive belt alignment.
   b. Remove belt, invert and check for cracks and missing teeth.
   c. Check belt tension.

2. **Drive Shaft and Cycle Clutch**

   a. Drive shaft end play .001"-.003" (0,03-0,08mm).
   b. Check to see if cycle clutch latches at zero degrees.
   c. If fretting or corrosion exist, completely rebuild the cycle clutch, replacing all parts.
   d. Check latching surface of lead sleeve and fixed sleeve.
   e. Check drive (clutch slips at 330 degrees to 335 degrees).
   f. Check lead for 40 degrees to 80 degrees.
   g. Remove and replace cycle clutch spring at least once a year, at which time the end of the drive sleeve, drive arbor, and wear insert should be examined.

3. **Cycle Clutch Magnet and Detent**

   a. Check condition of armature base rubber bonding.
   b. Check armature residuals.
   c. Make sure magnet is tight in yoke.
   d. Check for .002"-.005" (0,05-0,13mm) clearance between the armature and cycle clutch sleeves when manually attracted.
   e. Check backlash detent binding.
   f. Check backlash detent for 4 degrees to 7 degrees overthrow.

4. **CBs**

   a. Remove as an assembly, clean contacts, and lightly lubricate pivot points.
   b. Check CB timing.

5. **Bias Clutches**

   a. Check for 8 to 9 ounces of low bias.

6. **Torque Limiter**

   a. Check for a reading of 20 to 25 (100 grams to 125 grams) on the gauge with an X5 blade.

7. **Leaders**

   a. Check for wear at sprocket holes.
   b. Ensure leader interposes properly.

8. **Detents**

   a. Check detent solenoids for free motion.
   b. Check stepping detents for wear.

9. **Stepping Shaft**

   a. Hold the stepping cam follower arm. Push the stepping arms front-to-rear. No free motion should be felt.

10. **Head Slide Assembly**

    a. Check the cam follower roller for binds.
    b. Check for .001" (0,03mm) up and down motion in head slide bearings.
    c. Head slide must move freely with spring removed.
    d. Check head position on search.

11. **Tape Path**

    a. Check for sticking micro switch plungers.
    b. Check tape support bellcrank for binds. **Note:** Check condition of tape beds.
    c. Check tape chute for cracks and dirt.

12. **Head Cables**

    a. Check for loose connections at the SMS card block.
    b. Check for proper head cable adjustment.

13. **Station Cover Interlock**

    a. Ensure that the station cover cannot be opened without depressing the unload button.

14. **Replace air filter annually.**

15. **Place the test tape on the machine and run a complete checkout procedure.**

    a. Head alignment (both stations).
    b. Search and playback references one through twenty-one.
    c. Check all record functions (I/O and console).
    d. Check all playback functions (console).

16. **Clean all covers.**

I/O CYCLE A, B, C & D

I. Remove Type Element
   A. Look for a worn type element
   B. Check upper ball socket play (horizontal and vertical)
   C. Check tilt, ring side play
   D. Check carrier shoe clearance
   E. Check carrier side play

II. Half Cycle Neg. 5 No Tilt Character
   A. Check rotate spring tension
   B. Check tilt detent side play
   C. Check tilt homing – correct any drift

III. Replace Type Element
   A. Check rotate for binds (pull shift arm)
   B. Check skirt clearance
   C. Half Cycle WTORM – check detenting and rotate detent side play
   D. Half cycle WTOM (solid arm). Correct for any drift over .020" (0,51mm) in negative (pay) direction
   E. Check timing on M

IV. Backspace
   A. Check B/S rack free motion
   B. Check carrier motion

V. Unlock Keyboard With Machine Off – Depress Carrier Keylever
   A. Check filter shaft clearance
   B. Check interposer travel after latching (.015") (0,38mm)
   C. Check cycle clutch keeper clearance (.000"-.002") (0,00-0,05mm)
   D. Check cycle clutch latch pawl overthrow and clutch latch bite on sleeve
   E. Check cycle shaft end play (.002"-.006") (0,05-0,15mm)
   F. Check cycle clutch spring for slippage

VI. Trip The Return And Hand Cycle Slowly
   A. Cycle clutch trip from print magnet
   B. Shift interlock cable
   C. Operational magnets tripping

TEST PROCEDURE FOR PROGRAM SEARCH

1. With a tape on the left tape station, depress the switch code button on the I/O. A switch code will be recorded, and a "j" will print on the paper. NOTE: Console switch code button may be used, but will not print a "j."

2. Depress the P.S. code button on the I/O. A program search code (1, 3, 4, 6, 7) will be recorded, and a "p" will print on the paper.

3. a. If the machine is not equipped with the red-ribbon option, depress the REF code button on the I/O. A reference will be recorded.

   b. If the machine is equipped with the red-ribbon option, depress the red-ribbon code button on the I/O. A red-ribbon code (3, 4, 5, 6, 7) will be recorded, and the ribbon should change to red. The ribbon should remain in red until a carrier return operation is performed.

Reference
Code
p01j
p02j
p03j
p04j
p05j
p06j
p07j
p08j
p09j
p10j
p20j
p30j
p40j
p50j
p60j
p70j
p80j
p90j
p99j
p49j
p09j
p01j
Stop Code

4. After the above operations have been tested, load a tape on the right station. Record 99 reference codes on the right tape. After each code, record its numeric representation, followed by a carrier return, eight spaces, and a switch code. For example, after reference code one, record a 1, a CR, eight spaces, and a switch code; after reference code two, record a 2, a CR, eight spaces, and a switch code; etc. Record only switch codes on the left tape.

5. Check for proper search operations of all reference codes, both forward and reverse, from 1 to 99. After each search, the machine will switch to the left tape, switch back to the right tape, and search to the new number dialed in the reference dial.

6. After this operation has been tested, rewind the left tape and record as shown on right ("p" denotes program search code, "j" denotes switch code).

NOTE: When recording a program tape, the carrier return button is automatically deactivated for one CR operation. This permits recording of the program in a columnar form.

7. Change the mode dial to "play left" and the start condition dial to "start." Dial in 01 in the reference dial, and depress the search button. The machine should function as follows:

   a. After searching to reference code number one on the left tape, the machine will read and store the program search code. It will then read and store a two-digit address in the program search tens' and units' registers. After reading the switch code, the machine will switch to the right station and search for the number stored in the program search register, ignoring the setting of the dial. The first search on the right station will be a rewind search. After this initial search, counter-to-tape orientation will be established on the right station, and all following search operations will be either forward or reverse.

   b. After search to 01 on the right tape, a 1 will be printed, carrier return will be performed, and a switch operation will occur.

   c. After switching to the left tape (program tape), the next program instructions will be performed (search on right tape to 02).

NOTE: Pull the wire in 573-2 N/C to allow single cycle operation.

   d. The machine should continue through the entire program and stop, addressing the left tape, when the stop code is read.

8. If the machine is **not** equipped with the library option, install the program tape on the right station, and the "number" tape on the left station. Repeat the above test.

TEST PROCEDURE FOR LIBRARY OPTION

1. Load the "number" tape on the right station and search to position 5. Record a program search code over the "5" that was recorded in step 4, above.

2. Repeat this operation at positions 10, 15, and 20.

3. At reference position 2 on the program tape, record the program on the left station as shown on the right.

4. With the start condition switch in the "start" position, dial "02" in the reference dial and search on the left tape. The machine should function as follows:

   a. The first four operations will function normally, and the machine will print out:

```
1
2
4
3
```

```
 1
 2
 4
 3
 6
 7
 9
 8
11
12
14
13
16
17
19
18
21
22
24
23
25
26
```

   b. When the machine is commanded under program control to search for 05 on the right tape, it will encounter a program search code. Reading a program search code on the right tape initiates a "new card" routine. The "library search right and left" relays will pick, along with the "switch cycle" relay. The machine will switch to the left tape and automatically search to the number in the "reference dial." This will return the tape to the beginning of the program. The program will be reread from the beginning. During the first program cycle, since the "library search right" relay is up, the search counter will be reset to 01 and the "first search right" relay will be repicked. This establishes counter-to-tape orientation on the right tape.

   c. The first program control read from the program tape will be "p01j." Since the counter has been reset to 01 and "first search right" has been picked, the machine has been forced into the same condition as if it were at the rewind position. When it is commanded to search for "01," it will merely search forward to the **next** reference code.

   d. The **complete** printout from this program will be as shown on the right.

5. On machines equipped with library option, the program tape must always be installed on the left station. This is because a program search code read from the right tape signals a "new card routine."

6. When recording a program tape, the 1 (one) must always be recorded from keyboard position zero, regardless of what character is typed by that particular element. Similarly, the 0 (zero) must always be recorded from position 35. This is because the machine is looking for a particular tilt and rotate combination in the bit relays, when storing a program address.

PARAGRAPH INDENT CHECKOUT

1. a. With the right and left-hand margins of the I/O set approximately as shown on the following pages, set tabs at 10 space intervals starting at the left margin and ending near the right margin.

   b. Depress indent button on the I/O to its latched down position.

2. a. Turn machine on and load tapes on both stations. Rotate mode switch to "adjust." The adjust light should come on. If not, depress reset adjust button. Then if light does not come on, check wiring. Depressing the reset adjust button should change the status of the light. The encode adjust button should have no effect.

   b. Repeat above procedure for "transfer adjust."

   c. In "transfer type" or "playback," the adjust light should be off and neither the reset or encode adjust buttons should affect the light.

   d. In "record," the encode and adjust button should change the light status. When the encode button is pushed, the MT console should record a "13567" code on tape. The reset button should be inoperative.

3. Record a tape with the following format on either station. Parenthesis will indicate tape codes.

(Carrier Return)	
(Carrier Return)	
1 (Enc. Adj.) 5 (Tabs)	Now is the time for (CR)
5 (Tabs)	all good men to come (CR)
(CR)	
1 (Enc. Adj.)	
1 (Tab)	Now is the time for all good men to come to the aid of their (CR)
country. (Tab) (Space)	Now is the time for all good men to come to the aid of their (CR)
country. (Tab) (Space)	Now is the time for all good men to come to the aid of their (CR)
country. (Tab) (Space)	Now is the time for all good men to come to the aid of their (CR)
(CR)	
3 (Tabs)	
3 (Tabs)	
3 (Tabs)	Now is the time for all good men to come (CR)
3 (Tabs)	to the aid of their country. Now is the (CR)
(CR)	time for all good men to come to the aid (CR)
1 (Enc. Adj.) 5 (Tabs)	of their country. Now is the time for all (CR)
1 (Enc. Adj.) (Stop)	

4. Play back the above tape in adjust, with the right margin set at pointer scale position no. 65. The hard copy should be similar to the following. Brackets will enclose descriptions of printer action.

(First enc adj. code will turn light off)	(5 Tabs)	Exactly as recorded:
		Now is the time for (CR)
(5 Tabs)		all good men to come (CR)
(CR)		
(Second enc. adj. code turns light on)		
(1 Tab)	Now is the time for all good men (CR near scale number 65)	
(1 Tab)	to come to the aid of their country. (CR near scale no. 65)	

NOTE: Tabs in first line are counted and until double carrier return or adjust on-off code is read, this tab level is maintained. (This 1 tab sequence will continue until a double carrier return is recognized.)

1 (Tab)	Now is the time for all good men to (CR)	
(CR)		
(3 Tabs)		Now is the time (CR near scale no. 65)
(3 Tabs)		Now is the time (CR near scale no. 65)
		(This 3 tab sequence will continue until a double carrier return is recognized.)
(3 Tabs)		Now (CR)
(CR)		
	(5 Tabs)	Exactly as recorded:
(Enc. adj. code turns light off)	(5 Tabs)	Now is the time for (CR)
(Enc. adj. code turns light on)	(Stop)	

5. a. Repeat step 4 with different start conditions (character, word, line, etc.). Two lines in each start/stop mode.

   b. Unlatch indent button by depressing and releasing. The reset and adjust buttons should be inoperative in all modes. Playback the previously recorded tape. The MT/ST should tab only on recorded tabs and the adjust should not change. (Adjust light will be on in adjust mode.)

6. a. (Factory) Set margins at "0" and "80." Playback paragraph indent test tape in adjust mode with indent button depressed.

   b. (Field) Prepare a tape with sufficient information to check automatic indentation for 7 different tab levels.

CARD READER TEST PROCEDURE

A. READ TO PRINTER FROM CARD READER

1. Place test deck 1 in card reader.
   a. Cards must be placed in hopper face down with the 12 edge to the left. Place card weight on top of deck.
   b. Depress feed key on card reader.
   c. Depress reader-on key on card reader.
2. The machine should automatically start in a read to printer operation when the start key is depressed.
3. The following printout should occur:

   1234567890
   ABCDEFGHIJKLMNOPQRSTUVWXYZ
   abcdefghijklmnopqrstuvwxyz
   [@ # $ % ¢ & * ( )

4. Test the machine in character, word and line.
   a. In character mode, the depression of the start switch should result in the print out of a single character.
   b. In the word and line modes, each start switch depression should result in the print out of a single line.
5. Test the operation of the stop switch. The card reader should stop when the switch is depressed and restart when the start switch is depressed.

CHECK OUT PROCEDURE CARD READER WITH ADDITIONAL CHARACTER CODING

1. The printer should be set as follows:

Left Margin	0
Right Margin	95
Tab Stops	10, 20, 60

2. Prepare a test tape with the following information recorded.

   a. Reference code
   b. This line only is on magnetic tape.
   c. Carrier return
   d. Switch to card code
   e. Auto search code

3. Rewind the tape and place the machine in the playback mode. Search for the proper reference code.
4. Load test deck 4 in the card reader. Depress the feed key.
5. Depress the reader on key.
6. Depress the start key.

7. The machine should start and print the following:

```
1234567890/-/  abcdefghijklmnopqrstuvwxyz          This is on card.
x              x              x                    x______________@&#$,,,...;;;½½½===''
This line only is on magnetic tape.
1234567890/0/  abcdefghijklmnopqrstuvwxyz          This is on card.
x              x              x                    x ______________@&#$,,,...;;;½½½===''
This line only is on magnetic tape.
1234567890/-/  abcdefghijklmnopqrstuvwxyz          This is on card.
x              x              x                    x ______________@&#$,,,...;;;½½½===''
This line only is on magnetic tape.
1234567890/-/  abcdefghijklmnopqrstuvwxyz          This is on card.
x              x              x                    x ______________@&#$,,,...;;;½½½===''
This line only is on magnetic tape.
1234567890/-/  abcdefghijklmnopqrstuvwxyz          This is on card.
x              x              x                    x ______________@&#$,,,...;;;½½½===''
This line only is on magnetic tape.
```

a. Observe the machine for the following:

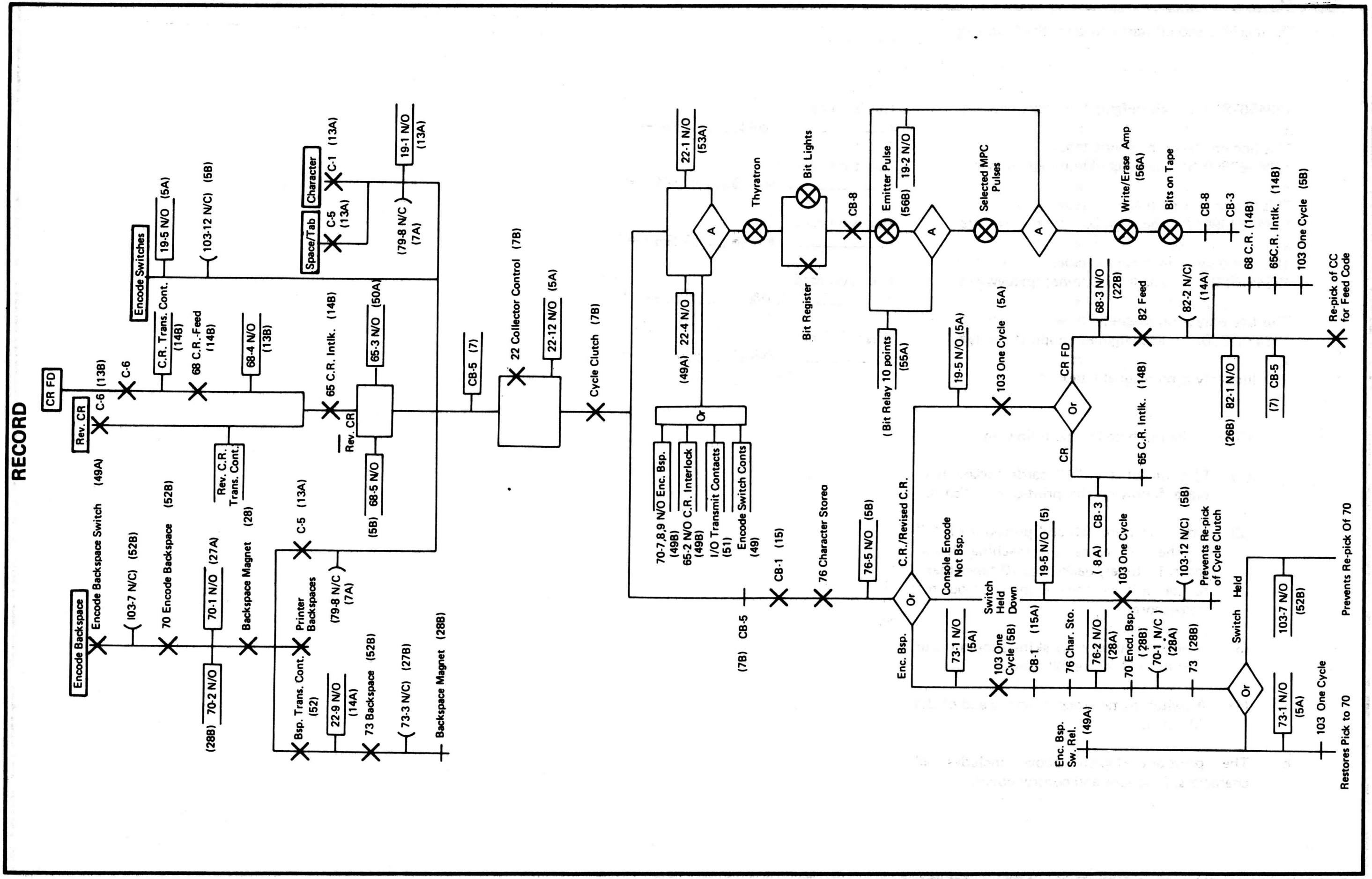
  (1) Ejection of the "1" cards should take place following the print-out of "card."

  (2) After the third tab and print-out of "x" on the "2" cards, the machine should space 10 times, backspace 10 times (back to the "x"), shift to UC and print out the underscore.

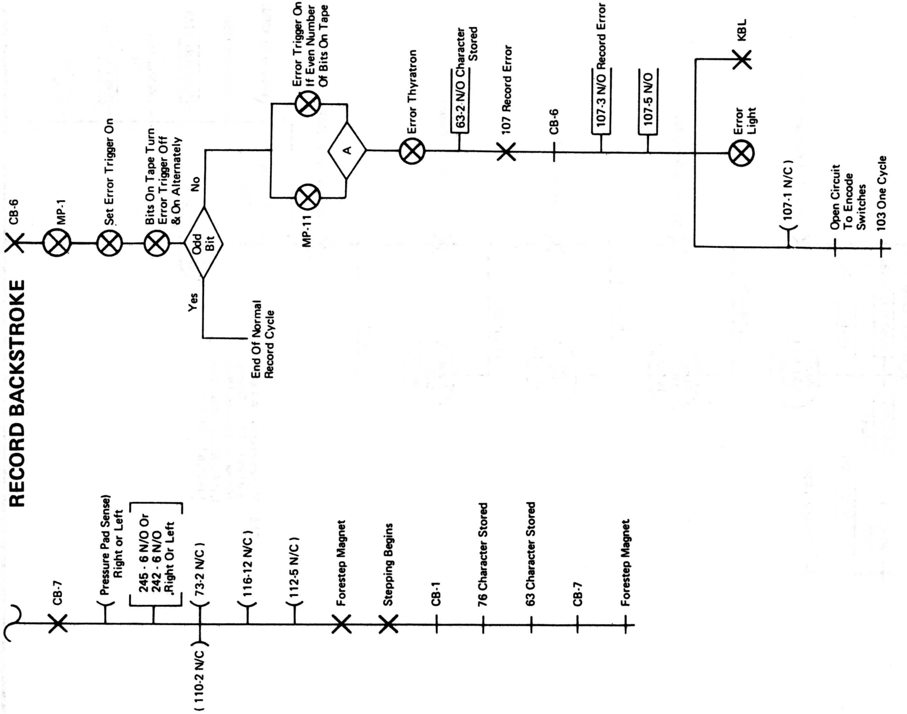
  (3) 7 single column card skips should occur near the end of the "2" card.

  (4) A switch to tape occurs at the end of the "2" card.

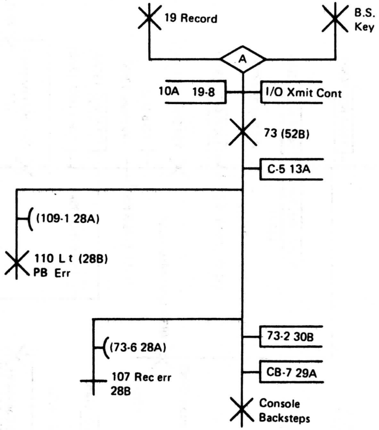
b. The print-out shown above includes all characters, functions and control codes.


RECORD
CR FD
Rev. CR
C-6 (13B)
C-6
C.R. Trans. Cont. (14B)
68 C.R.-Feed (14B)
68-4 N/O (13B)
Encode Switches
19-5 N/O (5A)
103-12 N/C) (5B)
Space/Tab
Character
C-5 (13A)
C-1 (13A)
19-1 N/O (13A)
(79-8 N/C (7A)
Rev. C.R. Trans. Cont. (28)
65 C.R. Intlk. (14B)
65-3 N/O (50A)
Rev. CR
68-5 N/O (5B)
CB-5 (7)
22 Collector Control (7B)
22-12 N/O (5A)
Cycle Clutch (7B)
Encode Backspace
Encode Backspace Switch (49A)
103-7 N/C) (52B)
70 Encode Backspace (52B)
70-1 N/O (27A)
70-2 N/O (28B)
Backspace Magnet (28)
C-5 (13A)
Printer Backspaces
(79-8 N/C (7A)
Bsp. Trans. Cont. (52)
22-9 N/O (14A)
73 Backspace (52B)
73-3 N/C) (27B)
Backspace Magnet (28B)
22-1 N/O (53A)
A
22-4 N/O (49A)
Or
70-7,8,9 N/O Enc. Bsp. (49B)
65-2 N/O C.R. Interlock (49B)
I/O Transmit Contacts (51)
Encode Switch Conts (49)
CB-5 (7B)
CB-1 (15)
76 Character Storeo
76-5 N/O (5B)
C.R./Revised C.R.
Thyratron
Bit Lights
Bit Register
CB-8
Emitter Pulse (56B)
19-2 N/O
Bit Relay 10 points (55A)
Selected MPC Pulses
Write/Erase Amp (56A)
Bits on Tape
CB-8
CB-3
68 C.R. (14B)
65C.R. Intlk. (14B)
103 One Cycle (5B)
68-3 N/O (22B)
82 Feed
82-2 N/C) (14A)
Re-pick of CC for Feed Code
19-5 N/O (5A)
103 One Cycle (5A)
CR FD
CR
65 C.R. Intlk. (14B)
82-1 N/O (26B)
(7) CB-5
CB-3 (8 A)
Console Encode Not Bsp.
Enc. Bsp.
Switch Held Down
19-5 N/O (5)
103 One Cycle
103-12 N/C) (5B)
Prevents Re-pick of Cycle Clutch
73-1 N/O (5A)
103 One Cycle (5B)
CB-1 (15A)
76 Char. Sto.
76-2 N/O (28A)
70 Encd. Bsp. (28B)
70-1 N/C) (28A)
73 (28B)
Switch Held
103-7 N/O (52B)
Prevents Re-pick Of 70
73-1 N/O (5A)
103 One Cycle
Enc. Bsp. Sw. Rel. (49A)
Restores Pick to 70

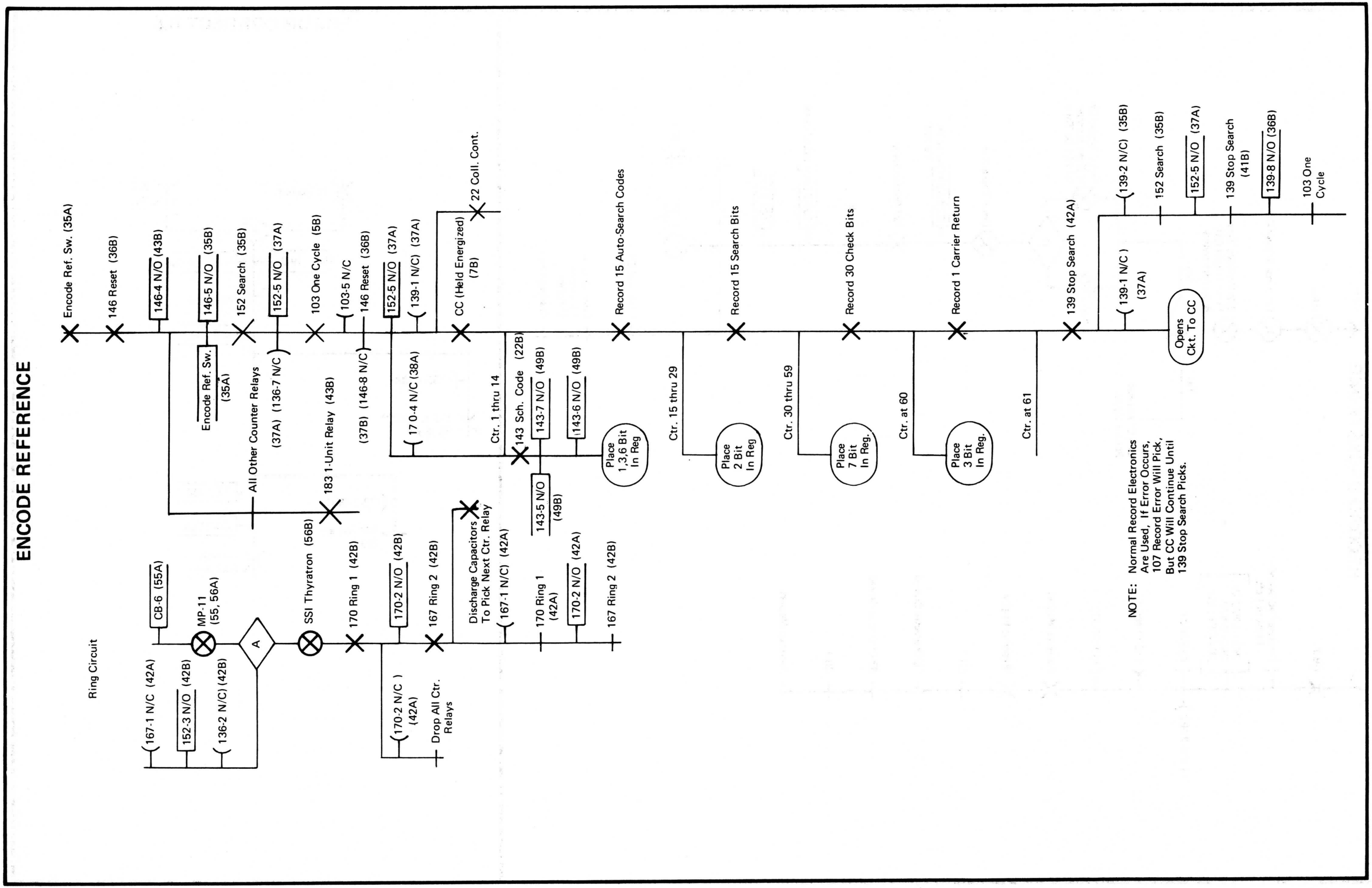
RECORD BACKSTROKE



ERROR CORRECT B.S.

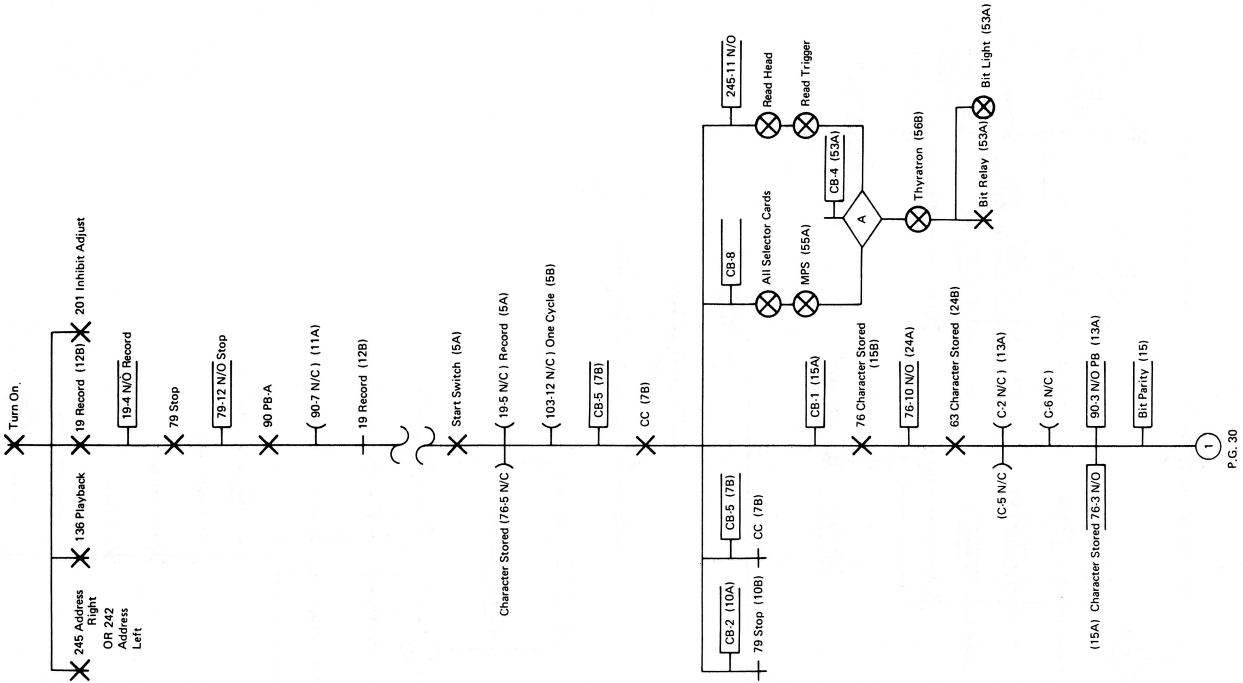


ENCODE REFERENCE

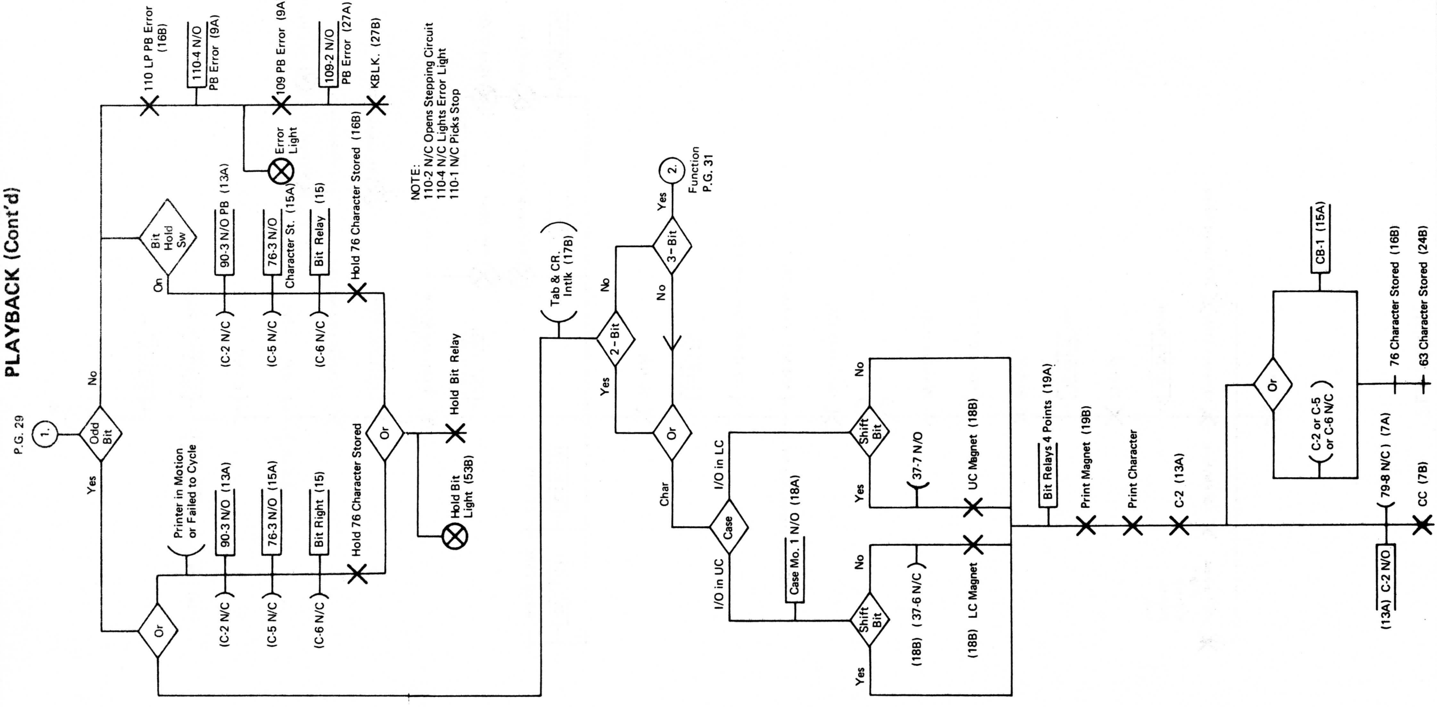


NOTE: Normal Record Electronics Are Used, If Error Occurs, 107 Record Error Will Pick, But CC Will Continue Until 139 Stop Search Picks.

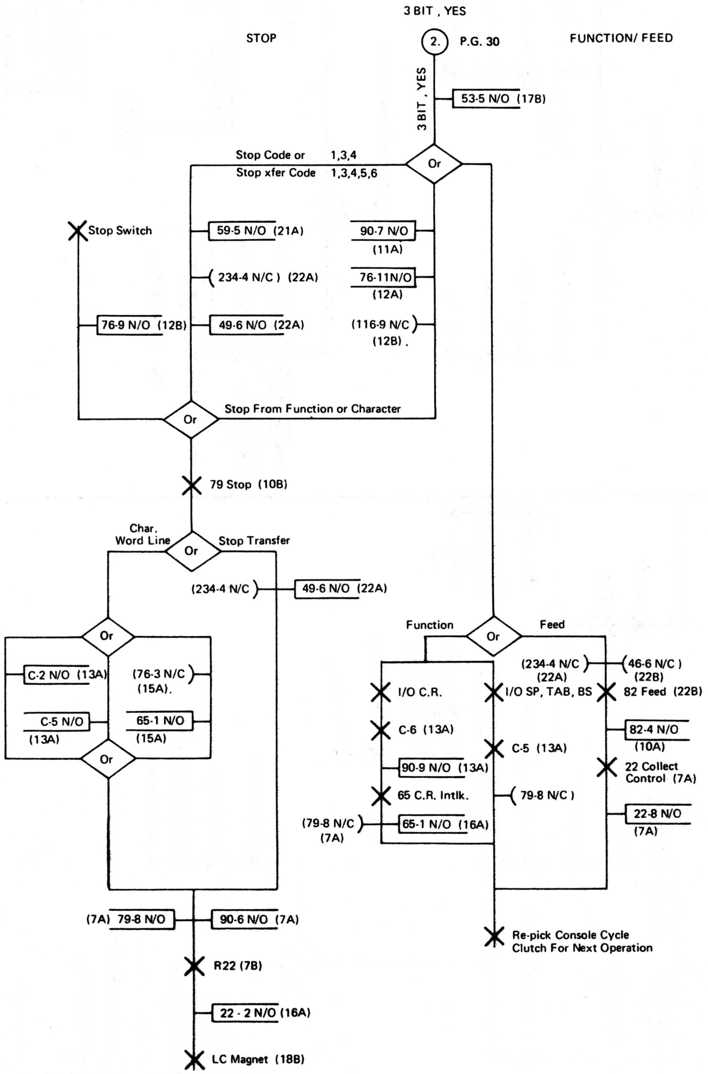
PLAYBACK


Turn On
19 Record (12B)
201 Inhibit Adjust
136 Playback
245 Address Right OR 242 Address Left
19-4 N/O Record
79 Stop
79-12 N/O Stop
90 PB-A
90-7 N/C) (11A)
19 Record (12B)
Start Switch (5A)
19-5 N/C) Record (5A)
Character Stored (76-5 N/C)
103-12 N/C) One Cycle (5B)
CB-5 (7B)
CC (7B)
245-11 N/O
Read Head
Read Trigger
CB-8
All Selector Cards
MPS (55A)
CB-4 (53A)
A
Thyratron (56B)
Bit Relay (53A)
Bit Light (53A)
CB-5 (7B)
CC (7B)
CB-2 (10A)
79 Stop (10B)
CB-1 (15A)
76 Character Stored (15B)
76-10 N/O (24A)
63 Character Stored (24B)
C-2 N/C) (13A)
(C-5 N/C)
C-6 N/C)
90-3 N/O PB (13A)
(15A) Character Stored 76-3 N/O
Bit Parity (15)
1
P.G. 30

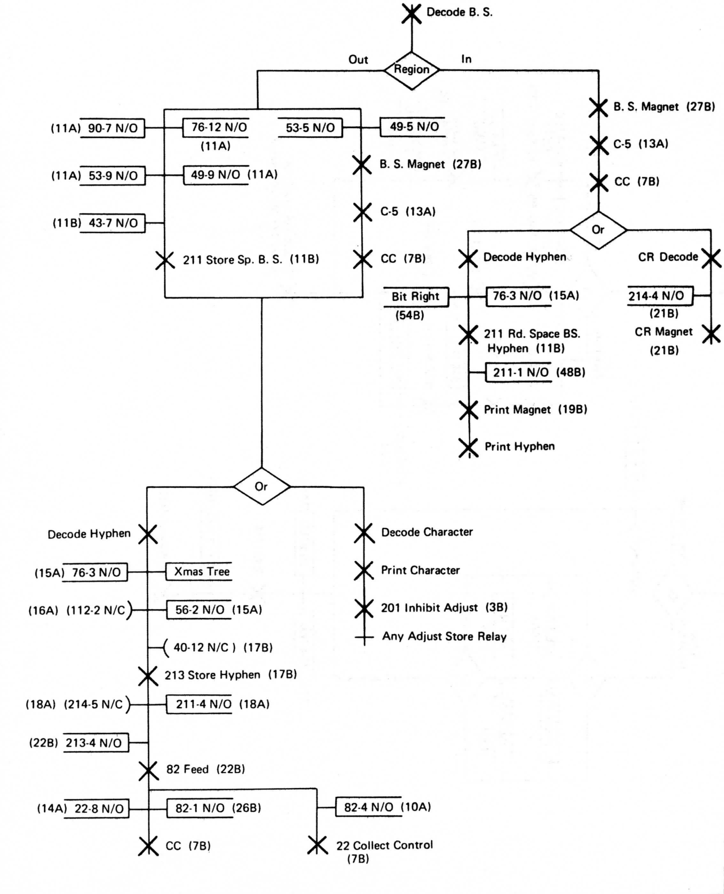
PLAYBACK (Cont'd)



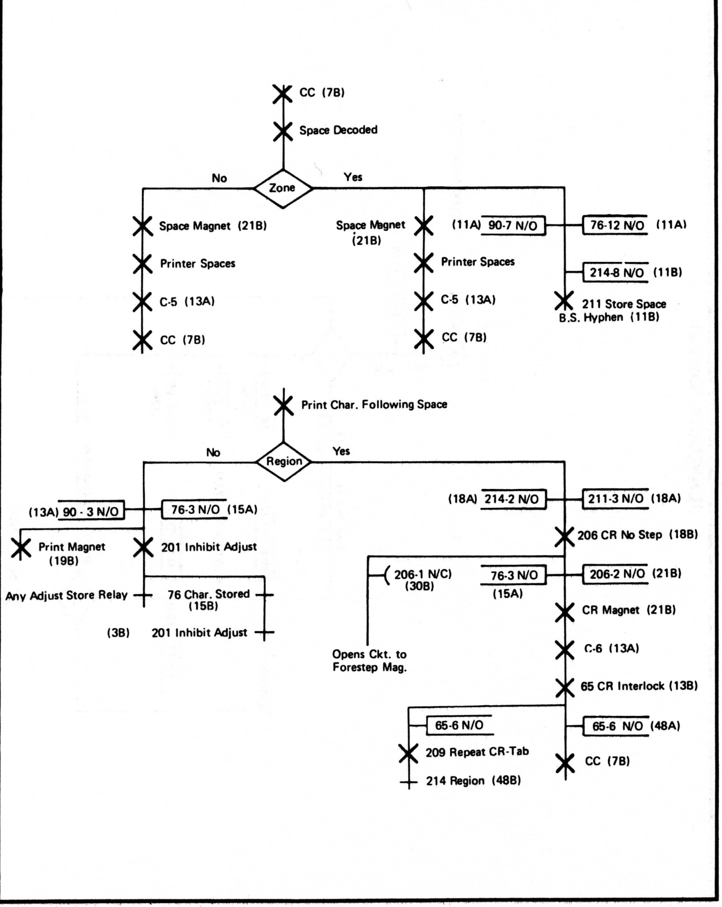
PLAYBACK (Cont'd)



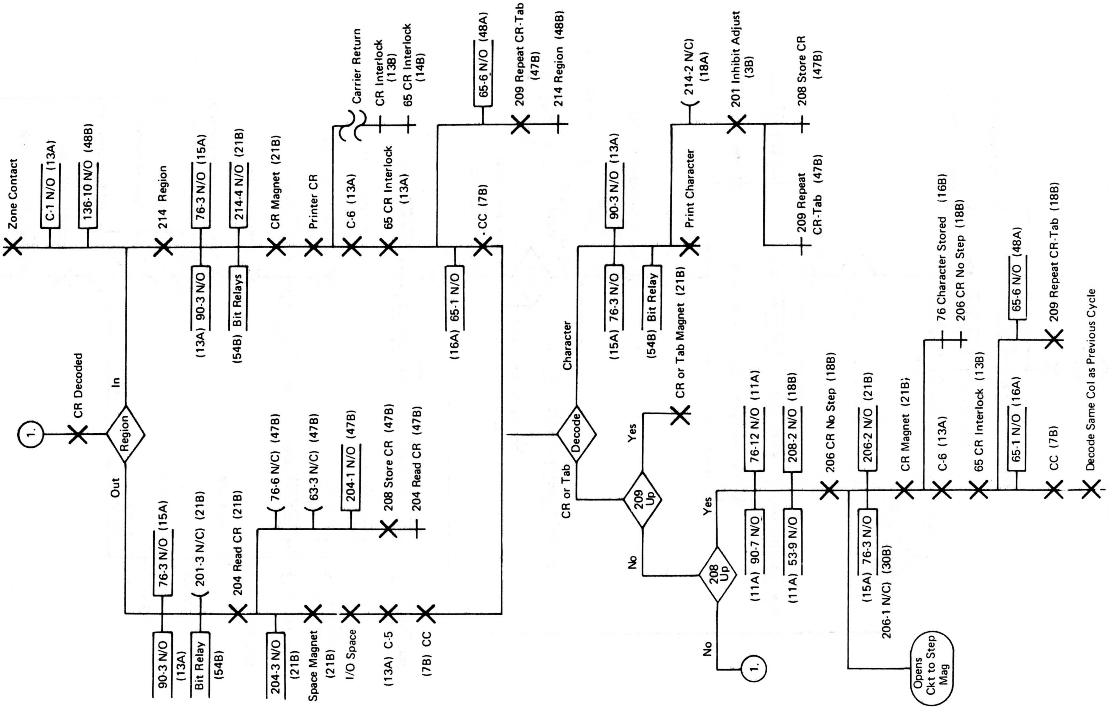
ADJUST HYPHEN



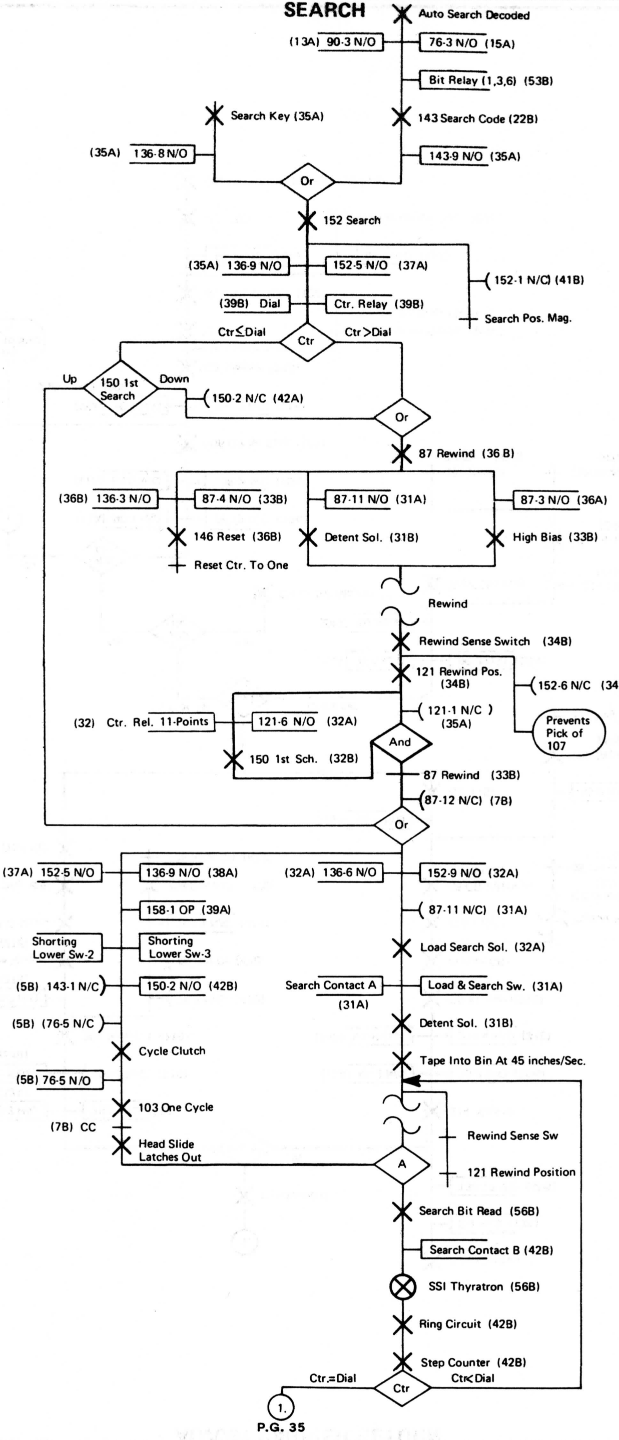
ADJUST SPACE



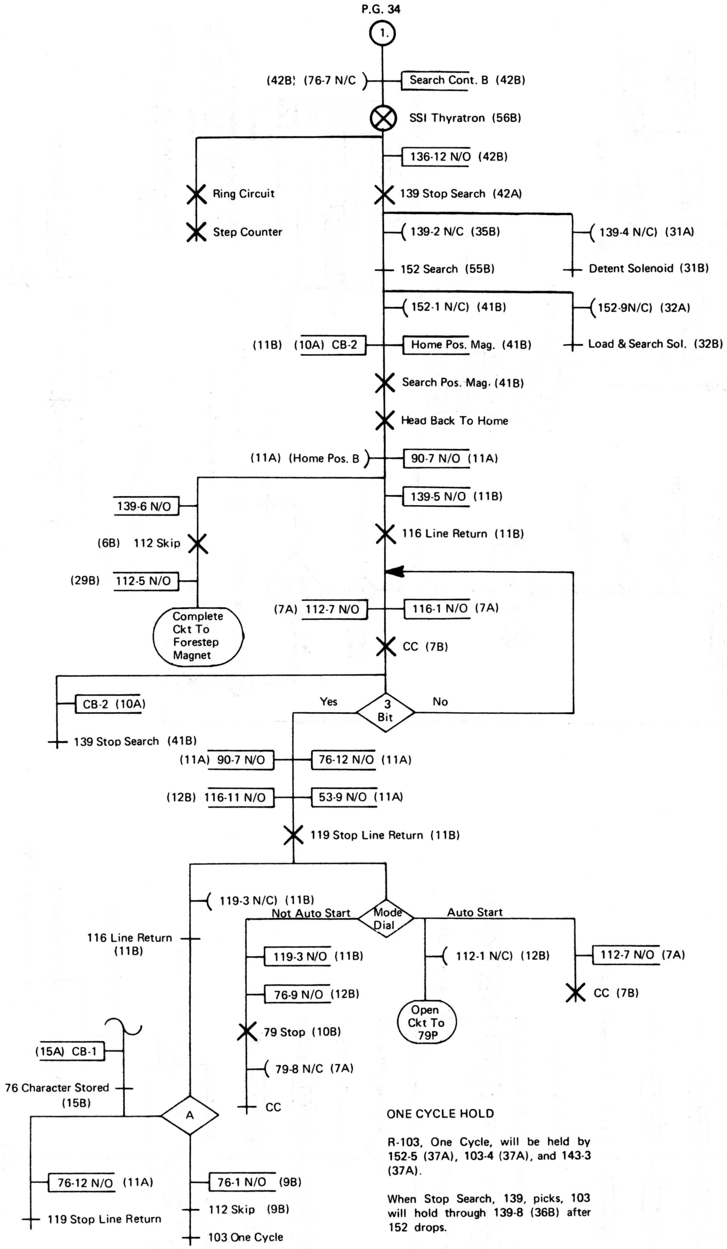
ADJUST CARRIER RETURN



SEARCH


Auto Search Decoded
(13A) 90-3 N/O
76-3 N/O (15A)
Bit Relay (1,3,6) (53B)
Search Key (35A)
143 Search Code (22B)
(35A) 136-8 N/O
143-9 N/O (35A)
Or
152 Search
(35A) 136-9 N/O
152-5 N/O (37A)
152-1 N/C) (41B)
(39B) Dial
Ctr. Relay (39B)
Search Pos. Mag.
Ctr≤Dial
Ctr
Ctr>Dial
Up
150 1st Search
Down
150-2 N/C (42A)
Or
87 Rewind (36 B)
(36B) 136-3 N/O
87-4 N/O (33B)
87-11 N/O (31A)
87-3 N/O (36A)
146 Reset (36B)
Detent Sol. (31B)
High Bias (33B)
Reset Ctr. To One
Rewind
Rewind Sense Switch (34B)
121 Rewind Pos. (34B)
152-6 N/C (34B)
121-1 N/C) (35A)
Prevents Pick of 107
(32) Ctr. Rel. 11-Points
121-6 N/O (32A)
And
150 1st Sch. (32B)
87 Rewind (33B)
87-12 N/C) (7B)
Or
(37A) 152-5 N/O
136-9 N/O (38A)
(32A) 136-6 N/O
152-9 N/O (32A)
158-1 OP (39A)
87-11 N/C) (31A)
Shorting Lower Sw-2
Shorting Lower Sw-3
Load Search Sol. (32A)
(5B) 143-1 N/C)
150-2 N/O (42B)
Search Contact A (31A)
Load & Search Sw. (31A)
(5B) (76-5 N/C)
Detent Sol. (31B)
Cycle Clutch
Tape Into Bin At 45 inches/Sec.
(5B) 76-5 N/O
103 One Cycle
(7B) CC
Rewind Sense Sw
Head Slide Latches Out
A
121 Rewind Position
Search Bit Read (56B)
Search Contact B (42B)
SSI Thyratron (56B)
Ring Circuit (42B)
Step Counter (42B)
Ctr.=Dial
Ctr
Ctr<Dial
1.
P.G. 35

SEARCH (Cont'd)

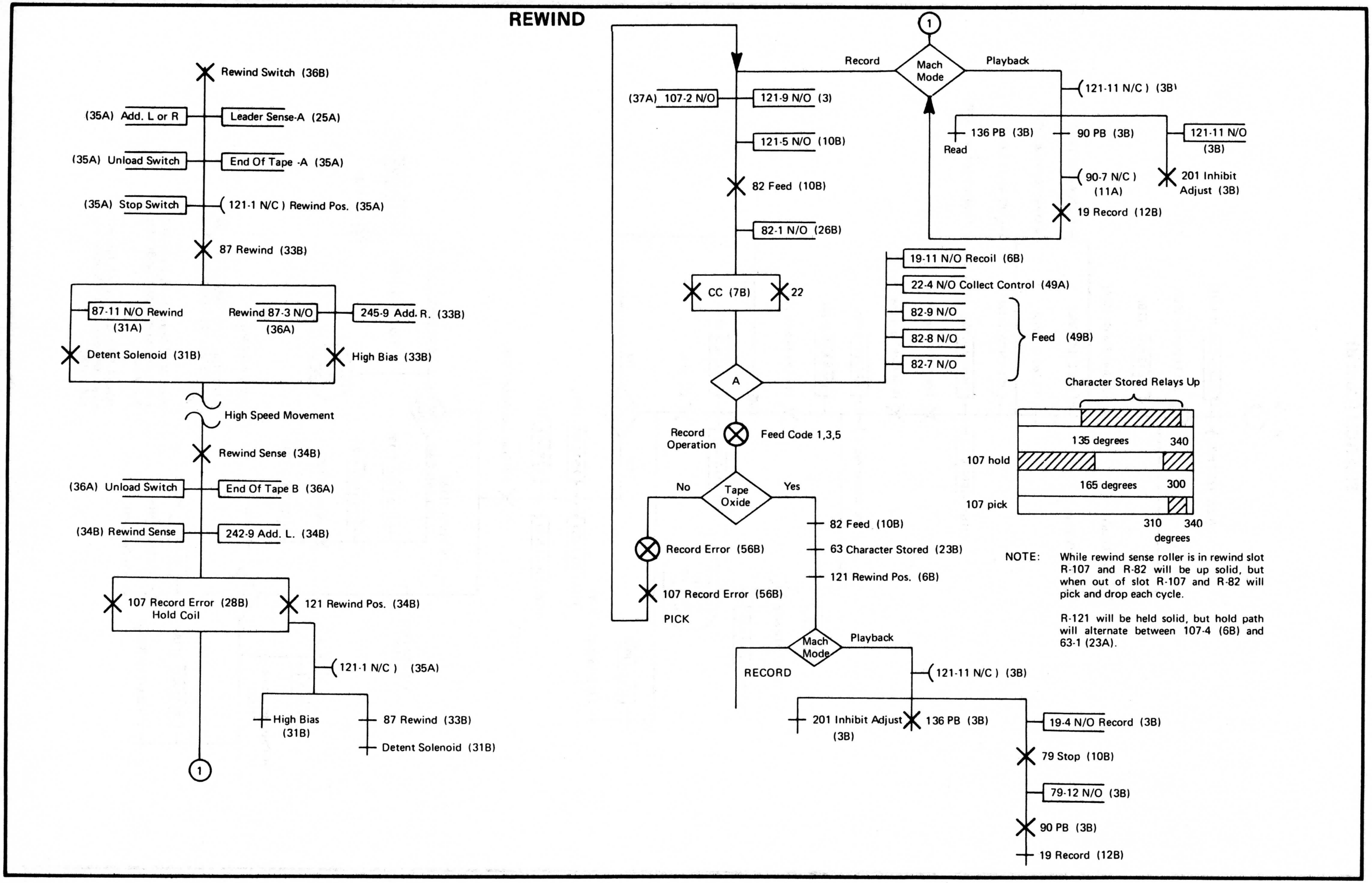


ONE CYCLE HOLD

R-103, One Cycle, will be held by 152-5 (37A), 103-4 (37A), and 143-3 (37A).

When Stop Search, 139, picks, 103 will hold through 139-8 (36B) after 152 drops.

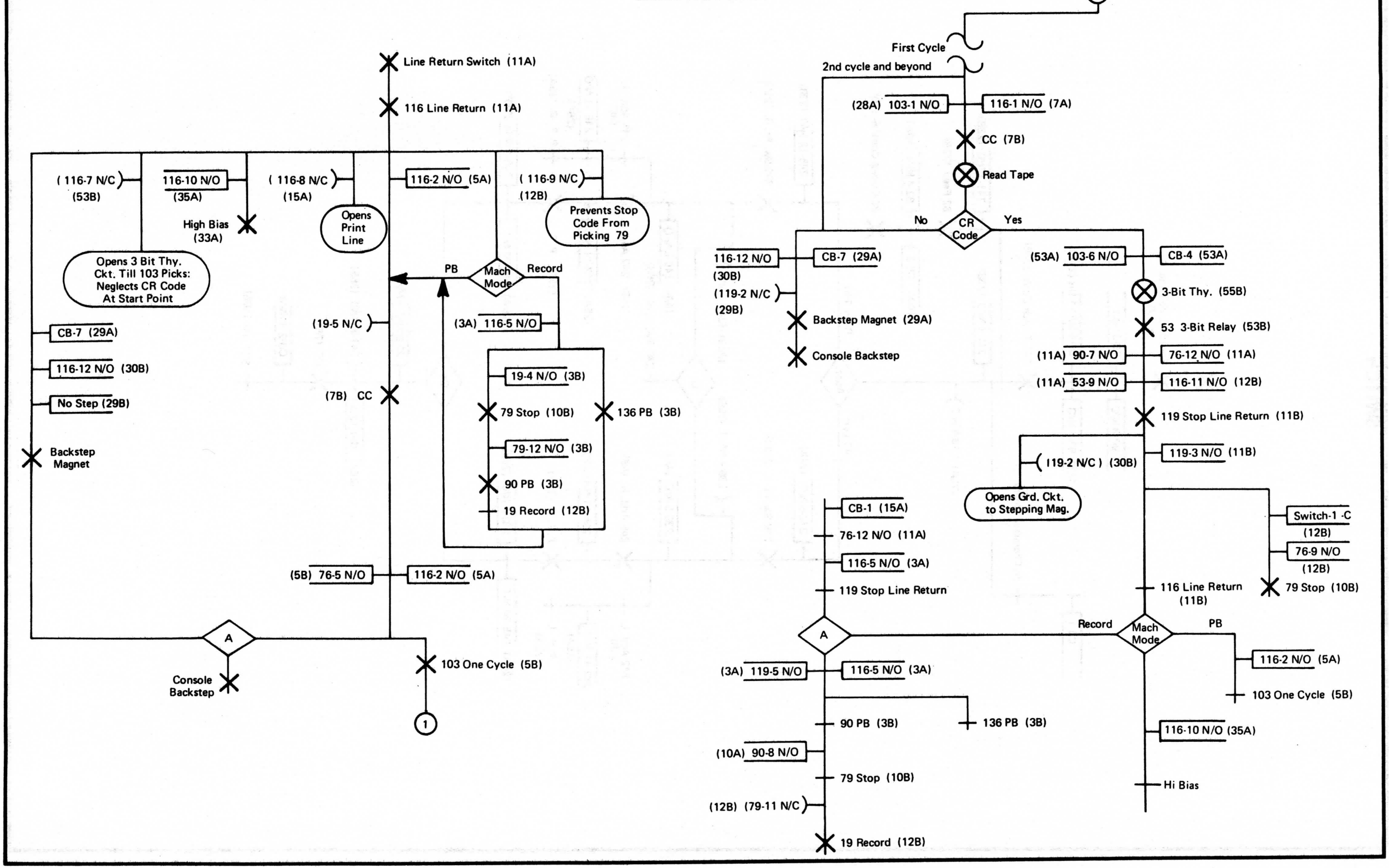
When R-116 and R-112 pick they will hold 103 through 112-8 (5A) and 116-2 (5A).



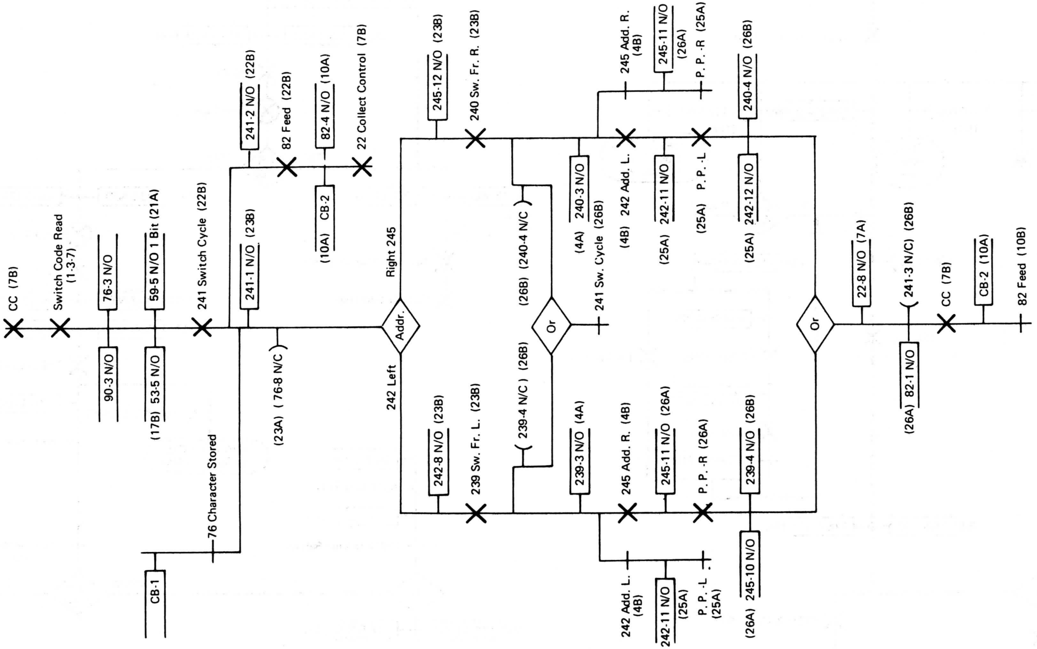
NOTE: While rewind sense roller is in rewind slot R-107 and R-82 will be up solid, but when out of slot R-107 and R-82 will pick and drop each cycle.

R-121 will be held solid, but hold path will alternate between 107-4 (6B) and 63-1 (23A).

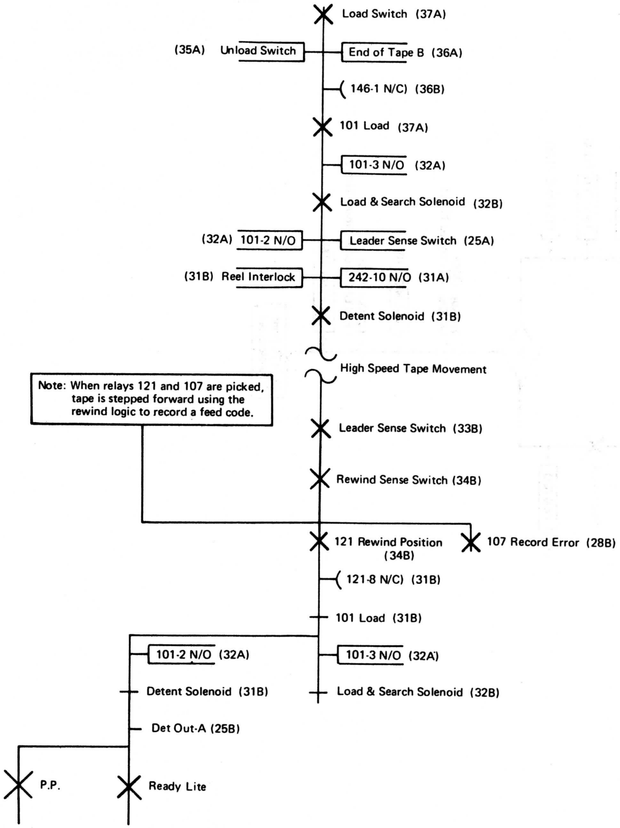
LINE RETURN


Line Return Switch (11A)
116 Line Return (11A)
(116-7 N/C) (53B)
116-10 N/O (35A)
High Bias (33A)
(116-8 N/C) (15A)
Opens Print Line
116-2 N/O (5A)
(116-9 N/C) (12B)
Prevents Stop Code From Picking 79
Opens 3 Bit Thy. Ckt. Till 103 Picks: Neglects CR Code At Start Point
PB
Mach Mode
Record
CB-7 (29A)
(19-5 N/C)
(3A) 116-5 N/O
116-12 N/O (30B)
19-4 N/O (3B)
No Step (29B)
(7B) CC
79 Stop (10B)
136 PB (3B)
79-12 N/O (3B)
Backstep Magnet
90 PB (3B)
19 Record (12B)
(5B) 76-5 N/O
116-2 N/O (5A)
A
103 One Cycle (5B)
Console Backstep
1
1
First Cycle
2nd cycle and beyond
(28A) 103-1 N/O
116-1 N/O (7A)
CC (7B)
Read Tape
No
CR Code
Yes
116-12 N/O (30B)
CB-7 (29A)
(119-2 N/C) (29B)
Backstep Magnet (29A)
Console Backstep
(53A) 103-6 N/O
CB-4 (53A)
3-Bit Thy. (55B)
53 3-Bit Relay (53B)
(11A) 90-7 N/O
76-12 N/O (11A)
(11A) 53-9 N/O
116-11 N/O (12B)
119 Stop Line Return (11B)
(119-2 N/C) (30B)
119-3 N/O (11B)
Opens Grd. Ckt. to Stepping Mag.
CB-1 (15A)
76-12 N/O (11A)
116-5 N/O (3A)
119 Stop Line Return
Switch-1 -C (12B)
76-9 N/O (12B)
116 Line Return (11B)
79 Stop (10B)
A
Record
Mach Mode
PB
(3A) 119-5 N/O
116-5 N/O (3A)
116-2 N/O (5A)
103 One Cycle (5B)
90 PB (3B)
136 PB (3B)
116-10 N/O (35A)
(10A) 90-8 N/O
79 Stop (10B)
Hi Bias
(12B) (79-11 N/C)
19 Record (12B)

SWITCH

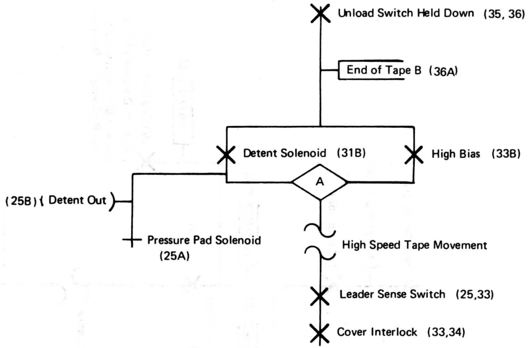

CC (7B)
Switch Code Read (1-3-7)
76-3 N/O
90-3 N/O
59-5 N/O 1 Bit (21A)
(17B) 53-5 N/O
241 Switch Cycle (22B)
241-1 N/O (23B)
241-2 N/O (22B)
82 Feed (22B)
82-4 N/O (10A)
(10A) CB-2
22 Collect Control (7B)
(23A) (76-8 N/C)
76 Character Stored
CB-1
Right 245
Addr.
242 Left
245-12 N/O (23B)
240 Sw. Fr. R. (23B)
(26B) (240-4 N/C)
(4A) 240-3 N/O
241 Sw. Cycle (26B)
245 Add. R. (4B)
245-11 N/O (26A)
P. P. -R (25A)
(4B) 242 Add. L.
(25A) 242-11 N/O
(25A) P. P. -L
240-4 N/O (26B)
(25A) 242-12 N/O
Or
242-8 N/O (23B)
239 Sw. Fr. L. (23B)
(239-4 N/C) (26B)
239-3 N/O (4A)
245 Add. R. (4B)
245-11 N/O (26A)
P. P. -R (26A)
239-4 N/O (26B)
242 Add. L. (4B)
242-11 N/O (25A)
P. P. -L (25A)
(26A) 245-10 N/O
Or
22-8 N/O (7A)
241-3 N/C) (26B)
(26A) 82-1 N/O
CC (7B)
CB-2 (10A)
82 Feed (10B)

LOAD

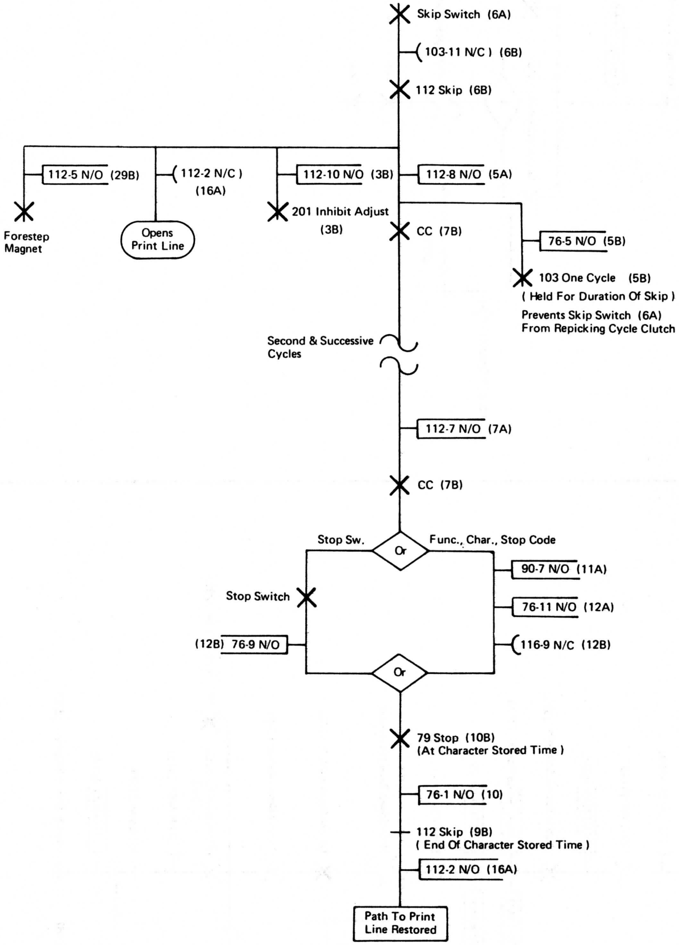


Note: When relays 121 and 107 are picked, tape is stepped forward using the rewind logic to record a feed code.

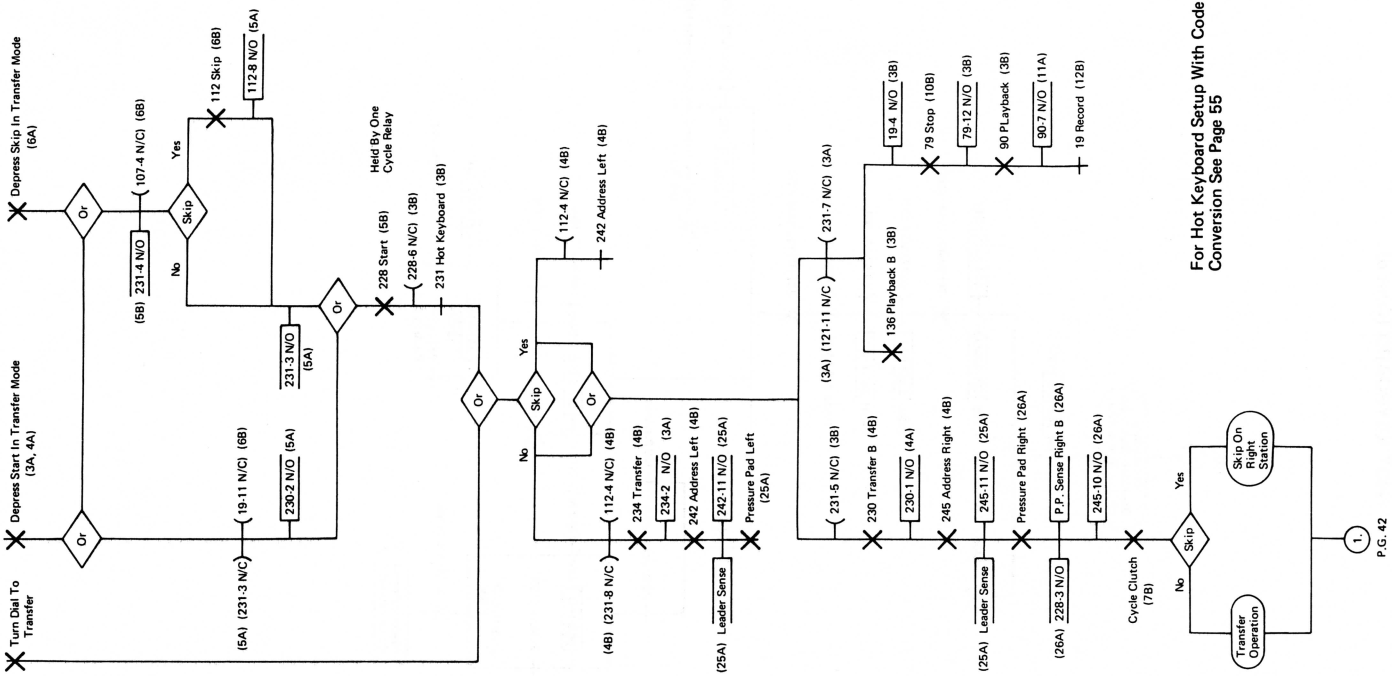
UNLOAD



SKIP

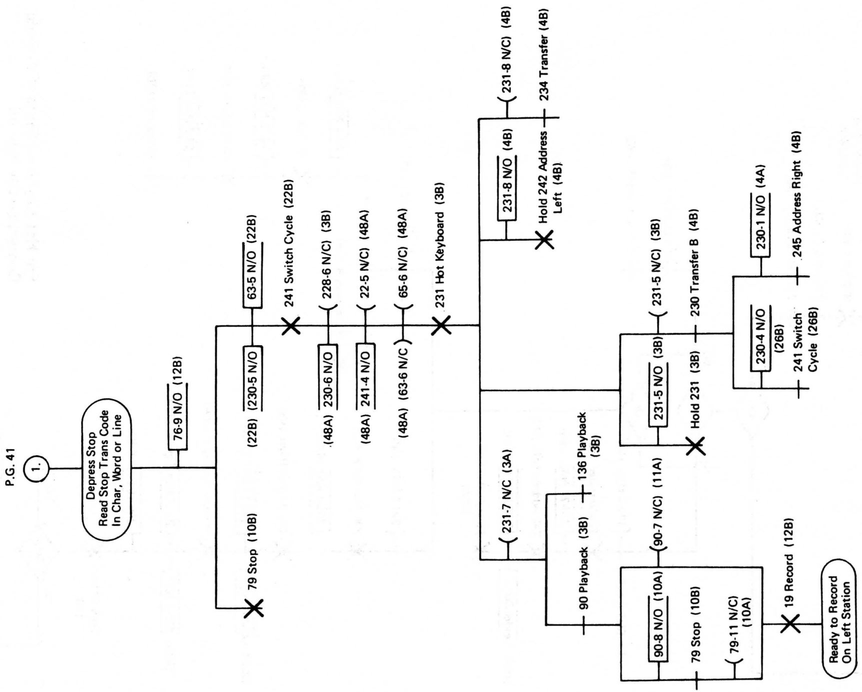

Skip Switch (6A)
103-11 N/C) (6B)
112 Skip (6B)
112-5 N/O (29B)
Forestep Magnet
112-2 N/C) (16A)
Opens Print Line
112-10 N/O (3B)
201 Inhibit Adjust (3B)
112-8 N/O (5A)
CC (7B)
76-5 N/O (5B)
103 One Cycle (5B)
(Held For Duration Of Skip)
Prevents Skip Switch (6A)
From Repicking Cycle Clutch
Second & Successive Cycles
112-7 N/O (7A)
CC (7B)
Stop Sw.
Or
Func., Char., Stop Code
90-7 N/O (11A)
76-11 N/O (12A)
116-9 N/C (12B)
Stop Switch
(12B) 76-9 N/O
Or
79 Stop (10B)
(At Character Stored Time)
76-1 N/O (10)
112 Skip (9B)
(End Of Character Stored Time)
112-2 N/O (16A)
Path To Print Line Restored

HOT KEYBOARD

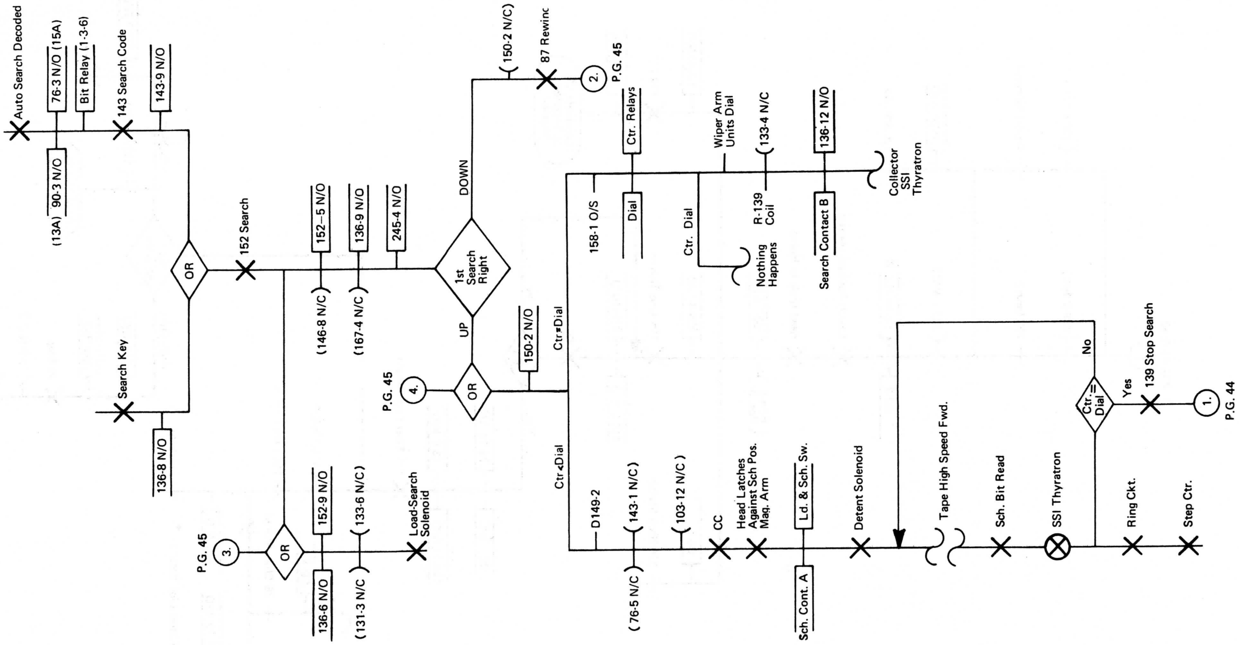


For Hot Keyboard Setup With Code Conversion See Page 55

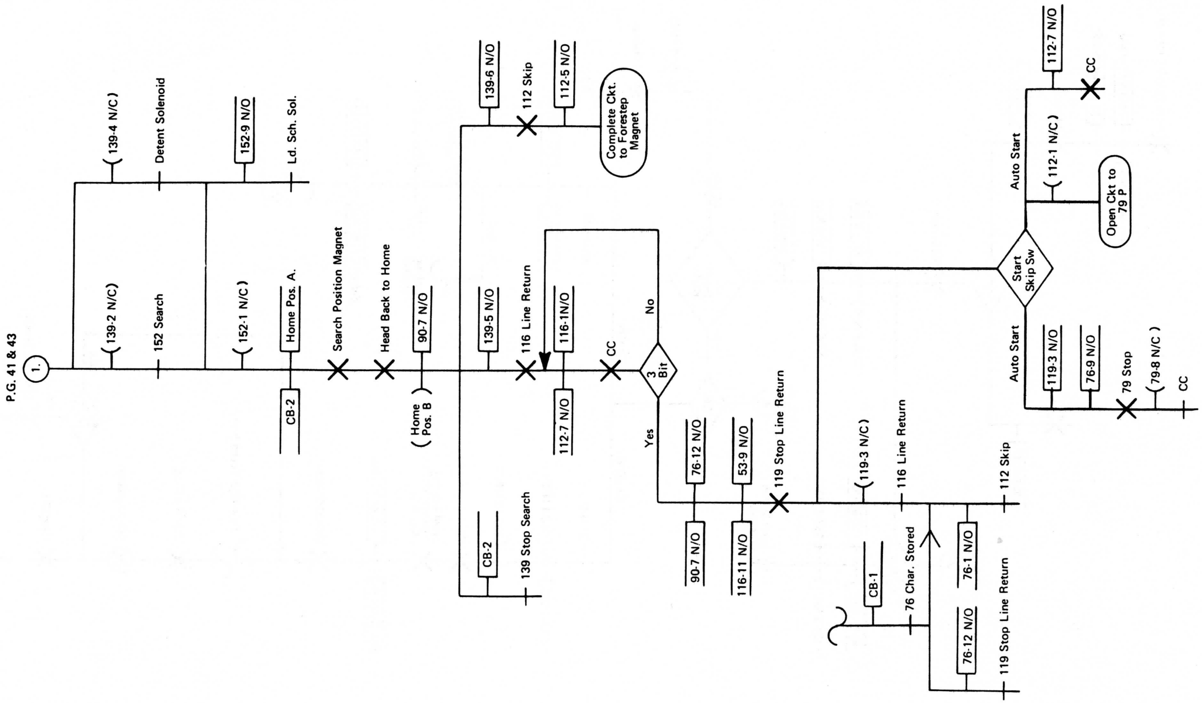
HOT KEYBOARD (Cont'd)



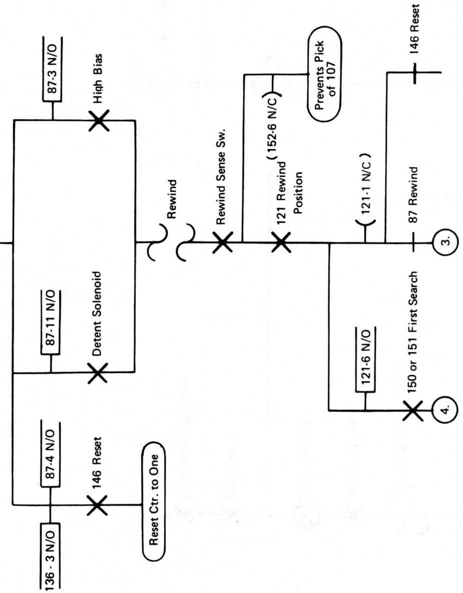
REVERSE SEARCH



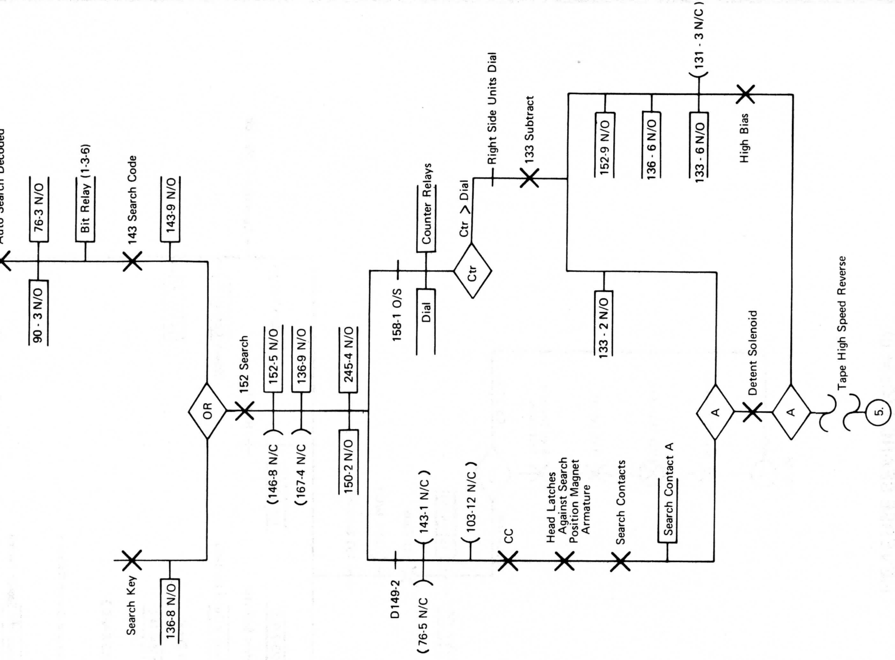
REVERSE SEARCH (Cont'd)



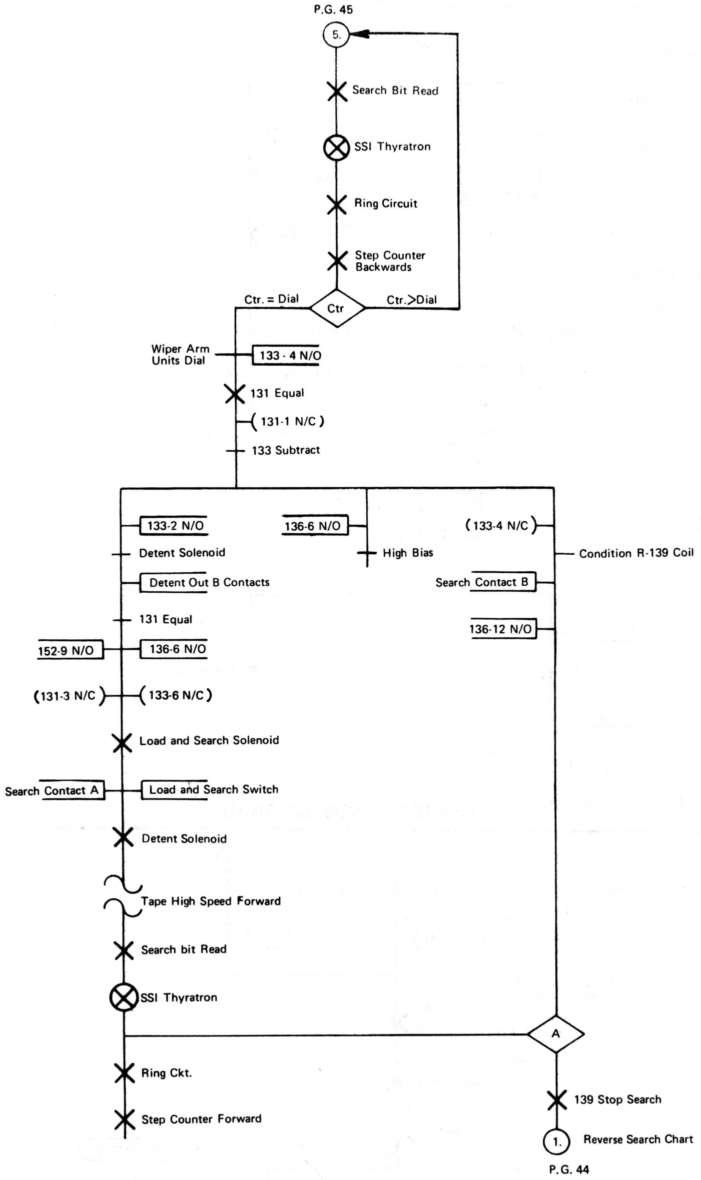
REWIND SEARCH



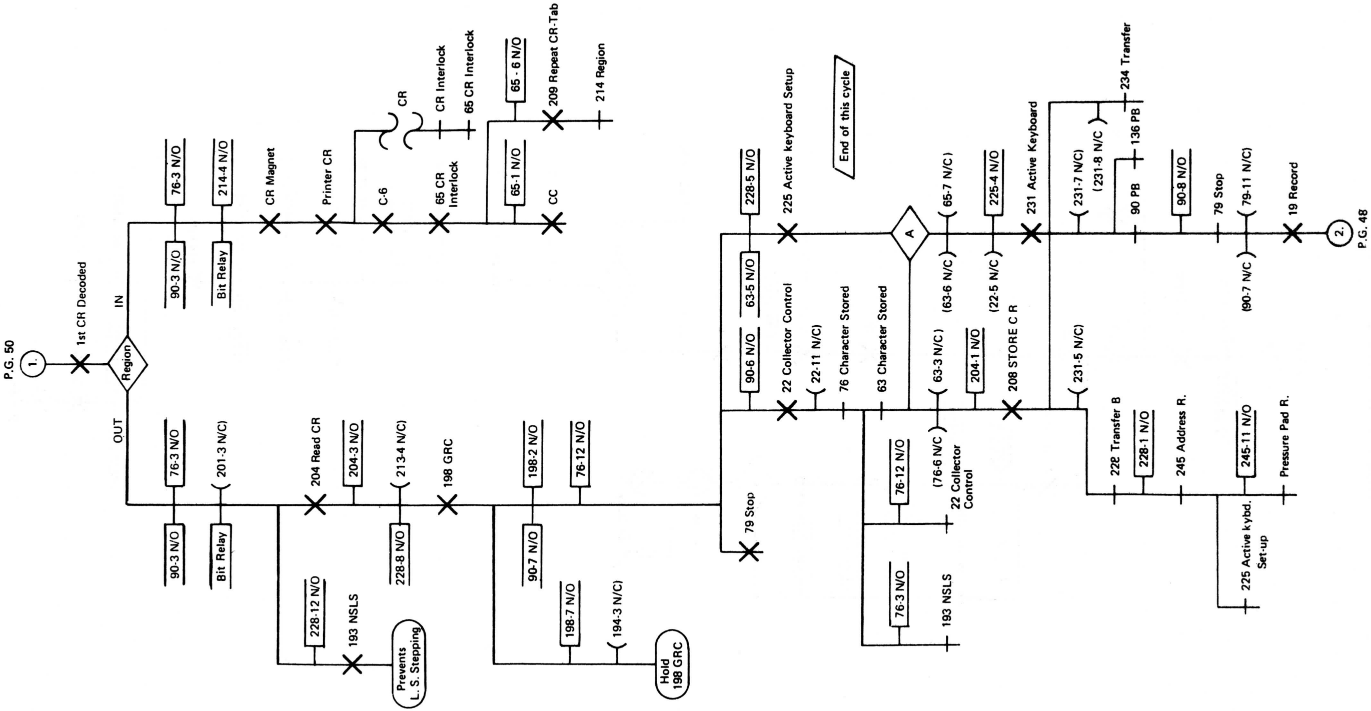
REVERSE SEARCH (Cont'd)



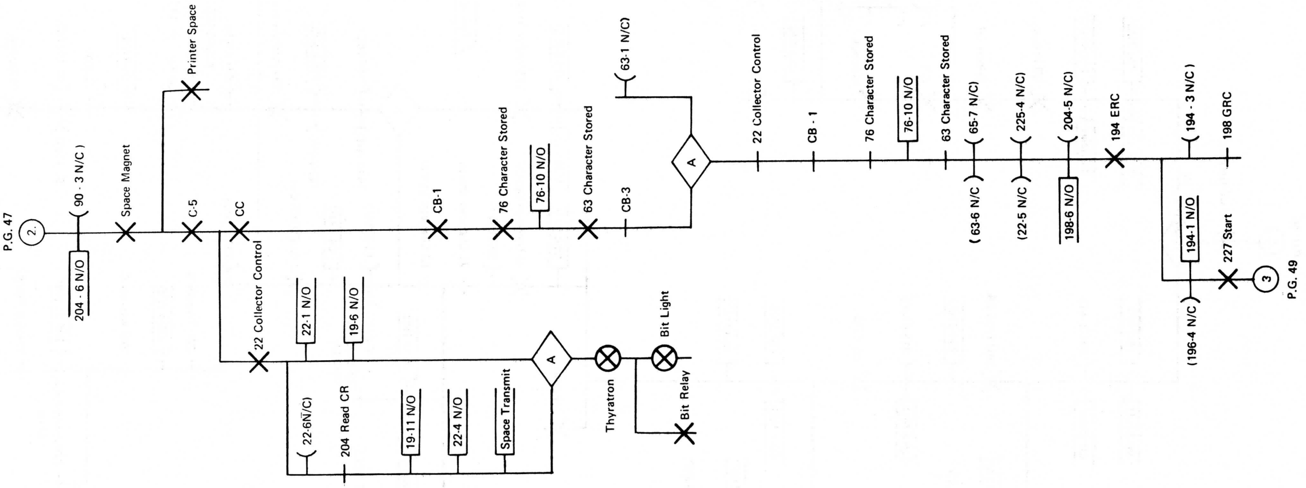
REVERSE SEARCH (Cont'd)



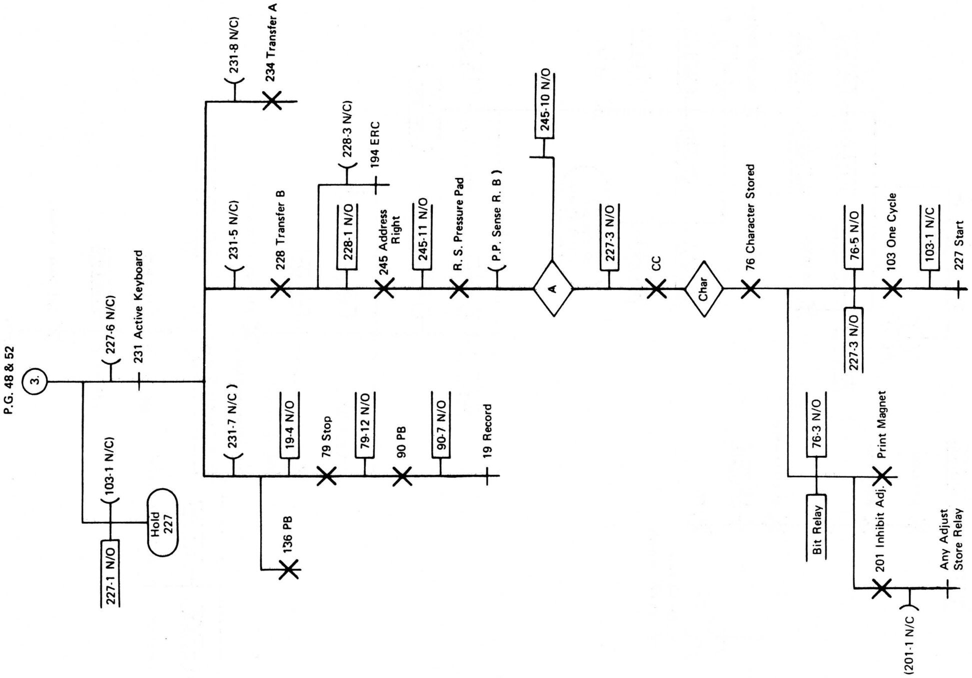
CODE CONVERSION



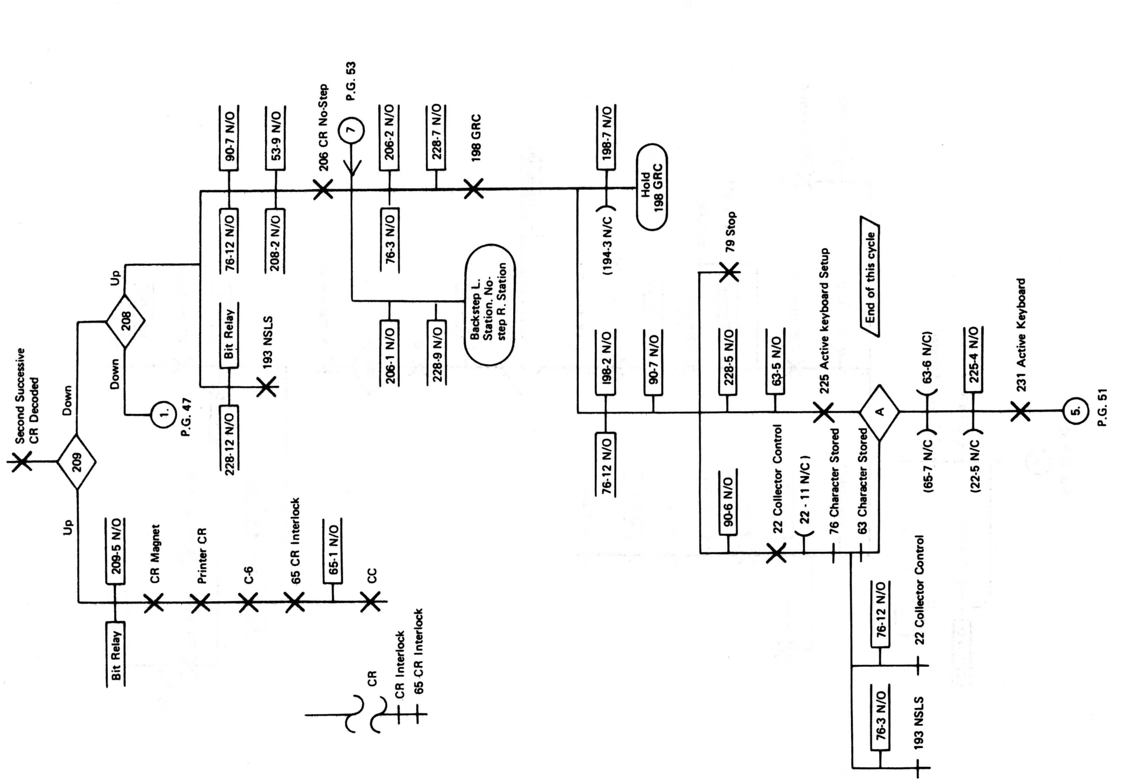
CODE CONVERSION (Cont'd)



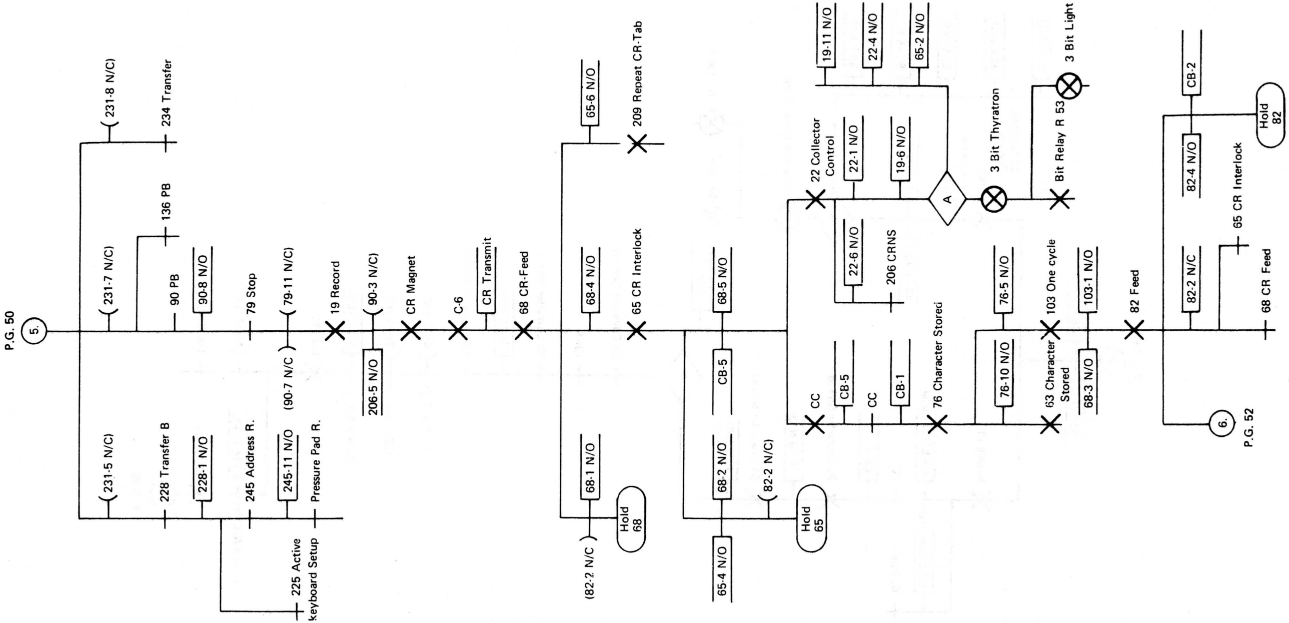
CODE CONVERSION (Cont'd)



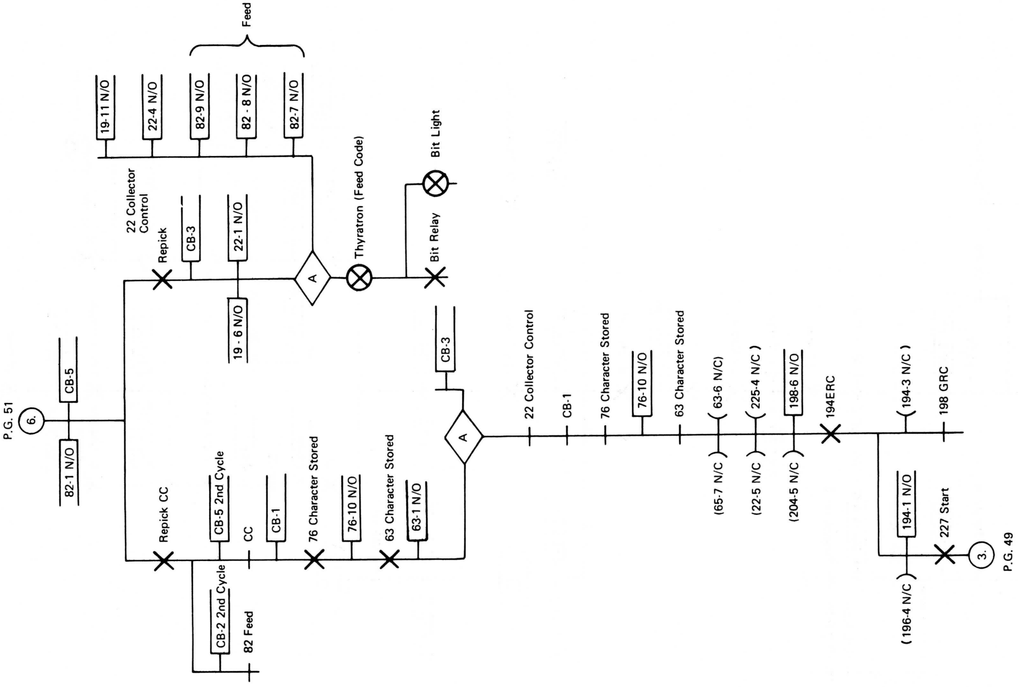
CODE CONVERSION (Cont'd)



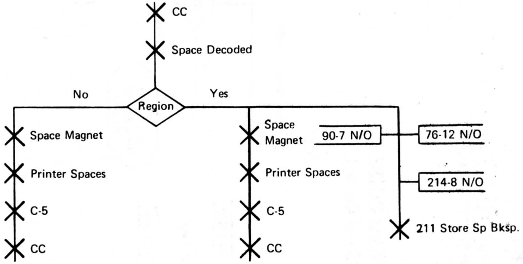
CODE CONVERSION (Cont'd)

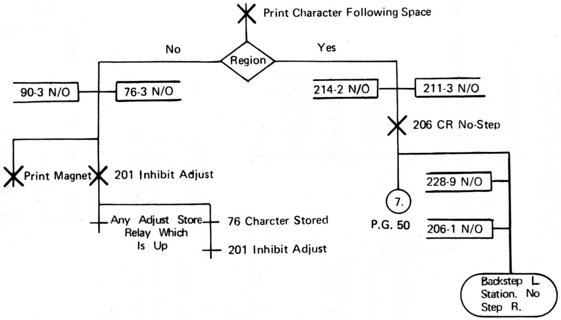


CODE CONVERSION (Cont'd)

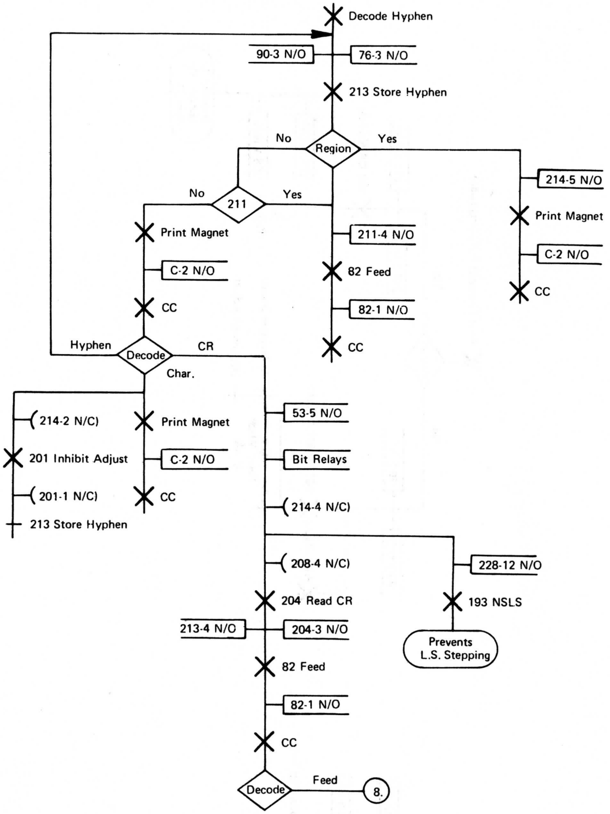


ADJUST SPACE
(Code Conversion)

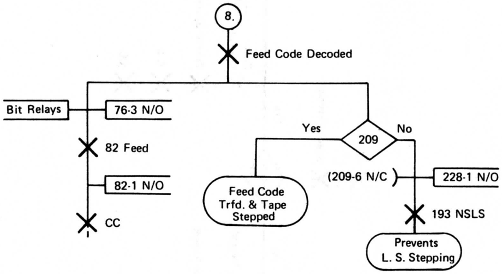




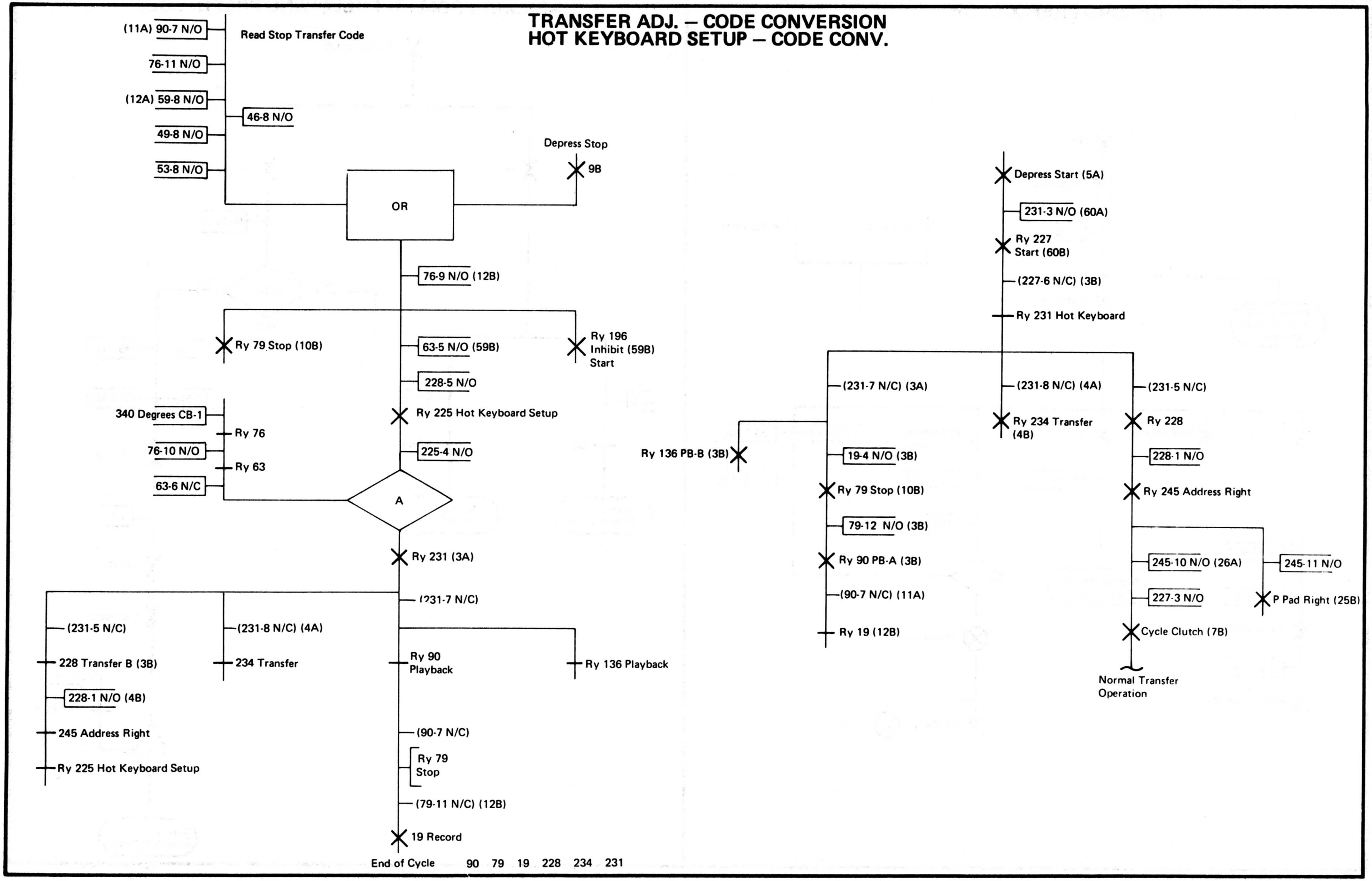
ADJUST HYPHEN
(Code Conversion)



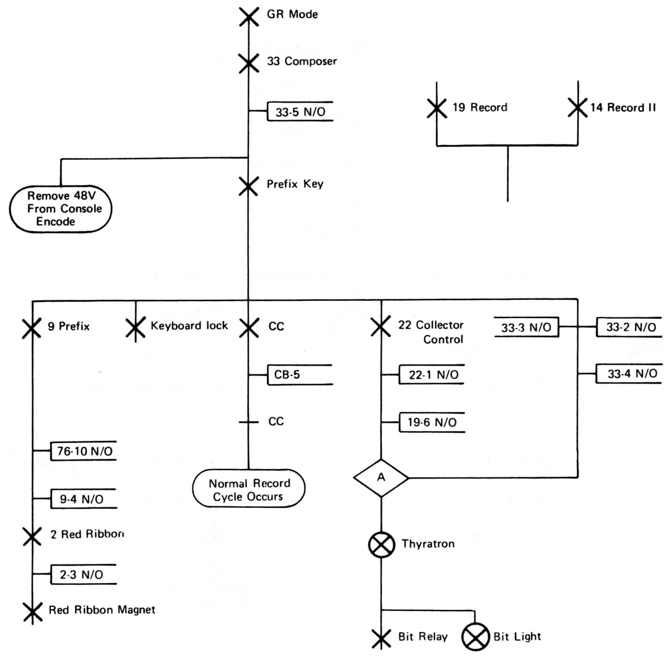
FEED CODE
(Code Conv.)



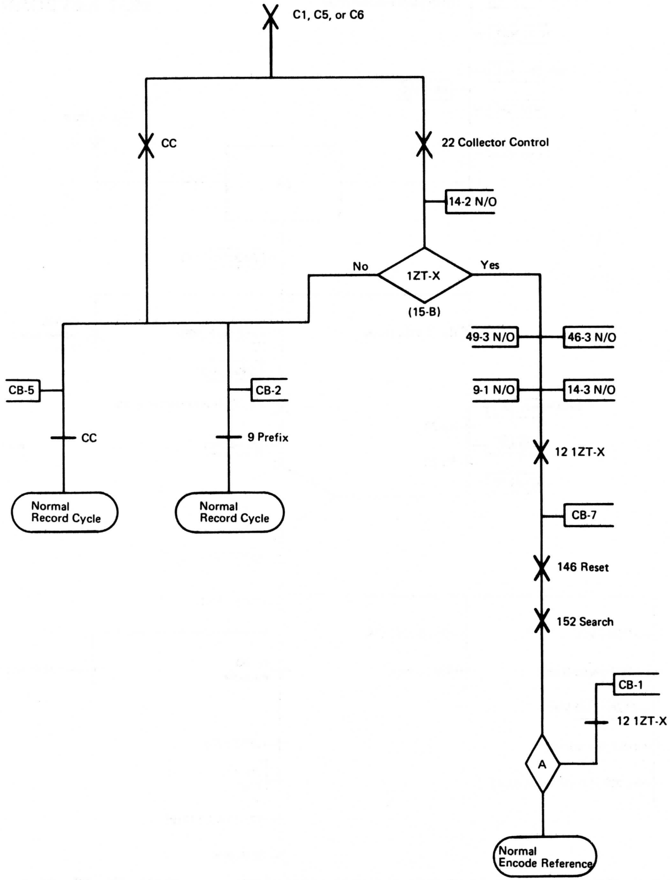
TRANSFER ADJ. – CODE CONVERSION
HOT KEYBOARD SETUP – CODE CONV.



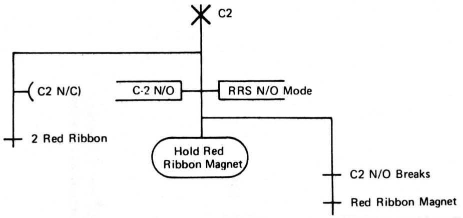
RECORD PREFIX CODE



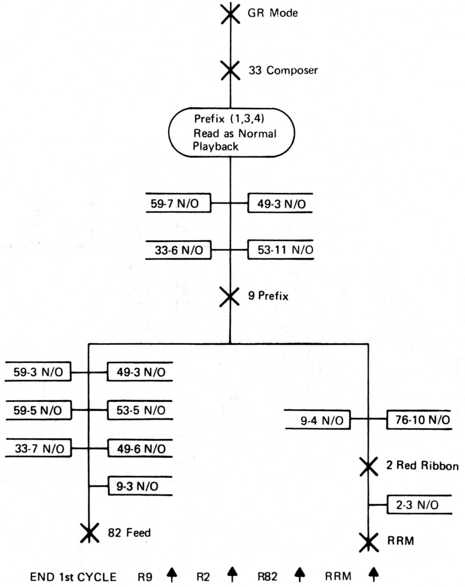
RECORD FROM I/O FOLLOWING PREFIX CODE



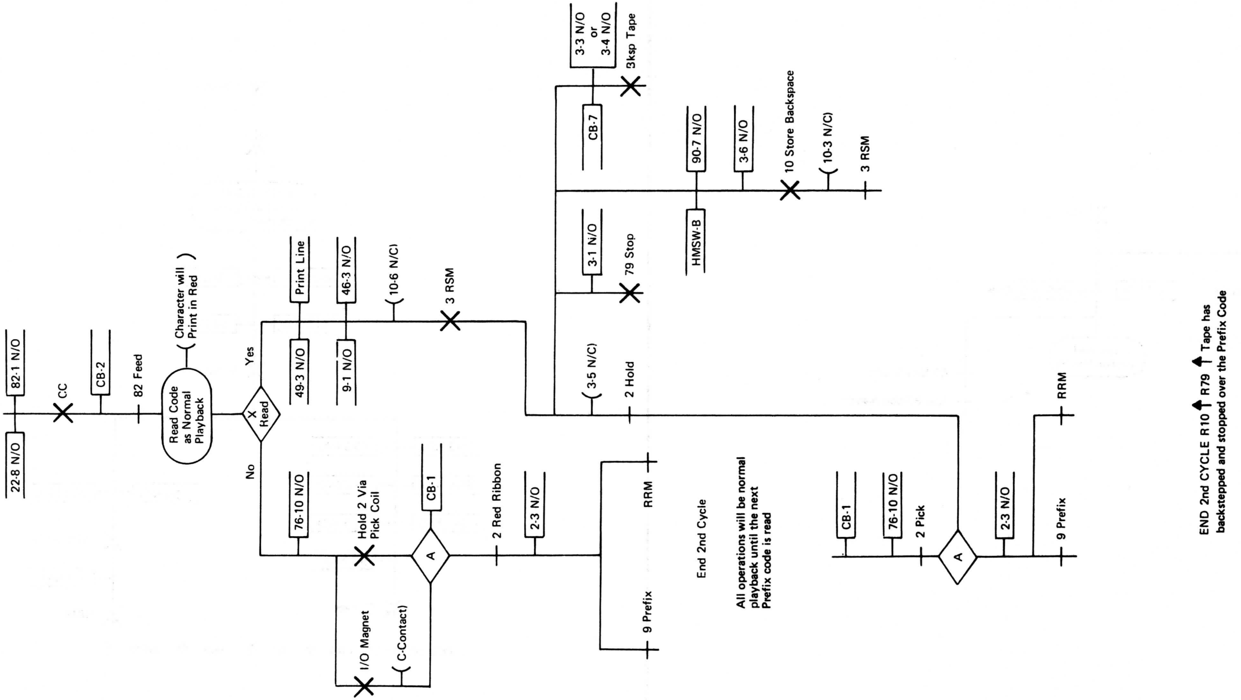
CHARACTER



PLAYBACK – GRAPHICS MODE READ PREFIX CODE (1st CYCLE)

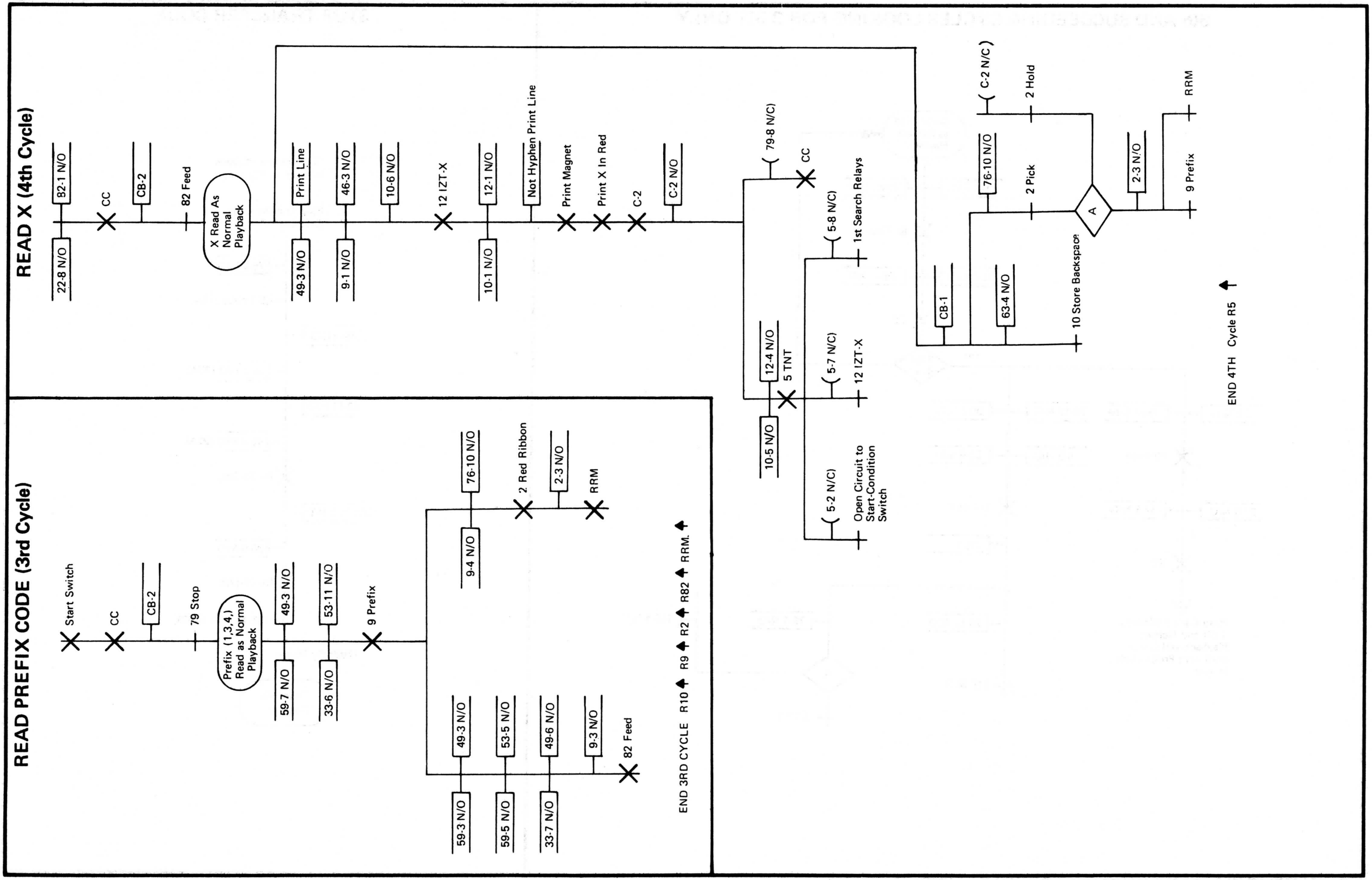


READ CODE FOLLOWING PREFIX CODE (2nd CYCLE)

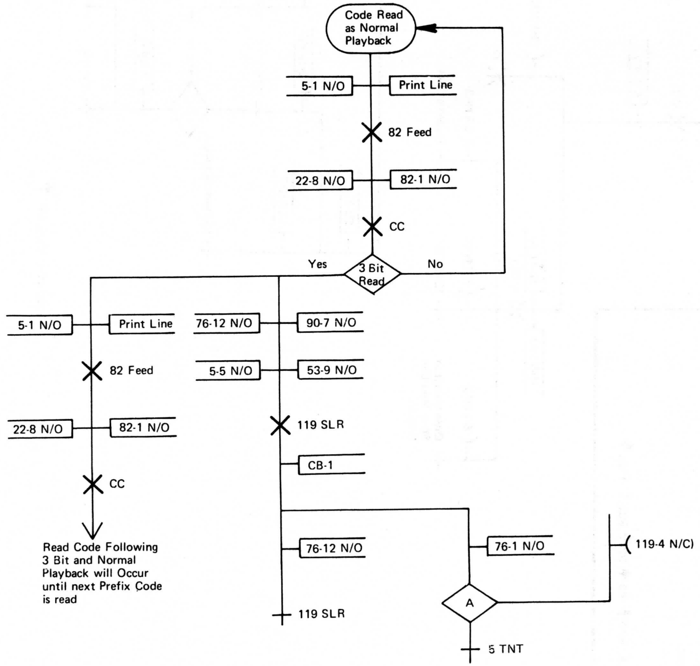


READ X (4th Cycle)

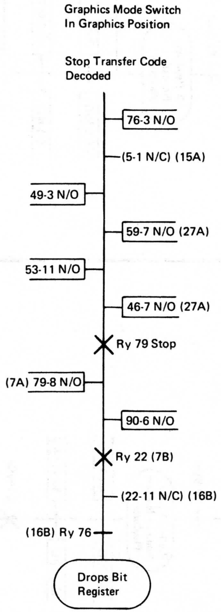
READ PREFIX CODE (3rd Cycle)



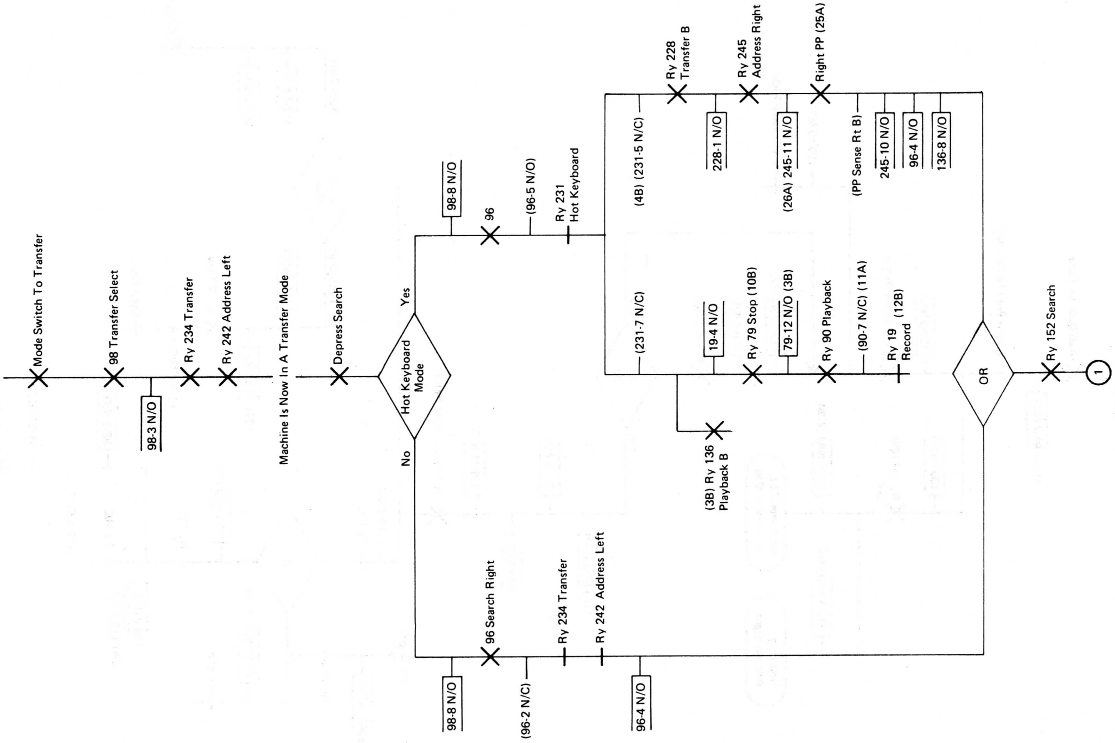
5th AND SUCCEEDING CYCLES LOOKING FOR 3 BIT ONLY



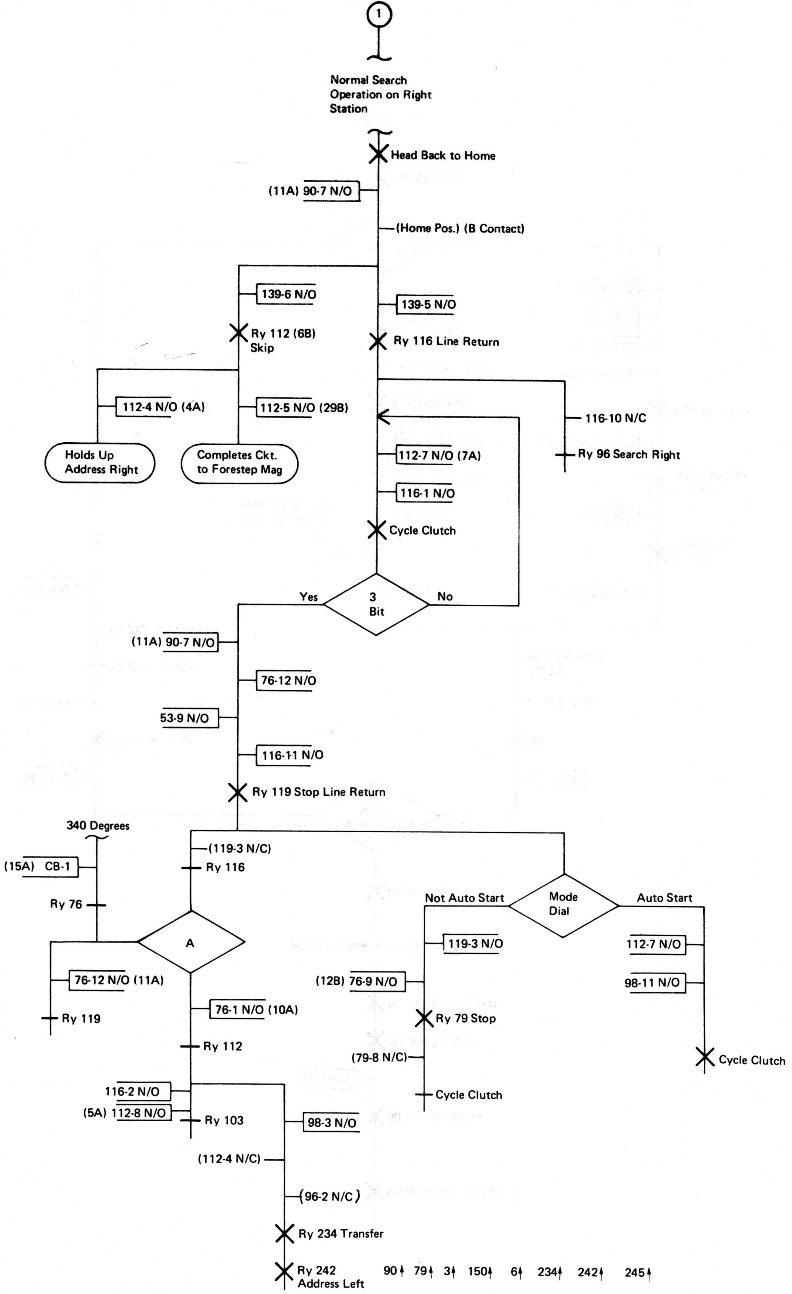
STOP TRANSFER CODE



SEARCH RIGHT STATION IN TRANSFER FEATURE



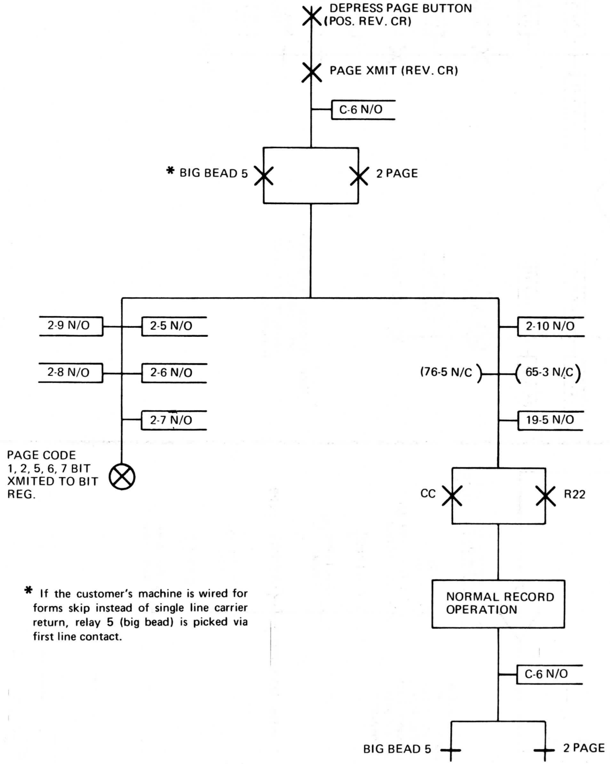
SEARCH RIGHT STATION IN TRANSFER FEATURE (Cont'd)



If a reference code is transferred (or skipped), the counter will be advanced one position to maintain the counter-to-tape orientation. This is accomplished by picking relay 95 when a search bit is recognized (via MP-6 and the read trigger) and holding 95 until the counter is advanced (via 167-1 NC).

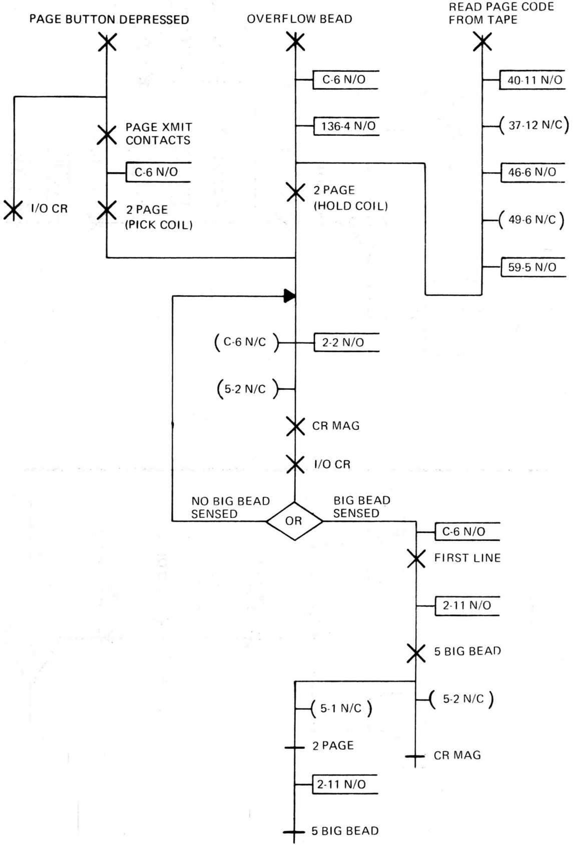
After the 15 search bits are transferred, the first check bit (7-bit) will be transferred. At this time, relay 170 will pick (via 76-7 NO, 95-2 NO, and 40-11 NO). Relay 170 will, in turn, pick 167, the counter will be advanced, and 95 will drop out (via 167-1 NC).

RECORD PAGE CODE



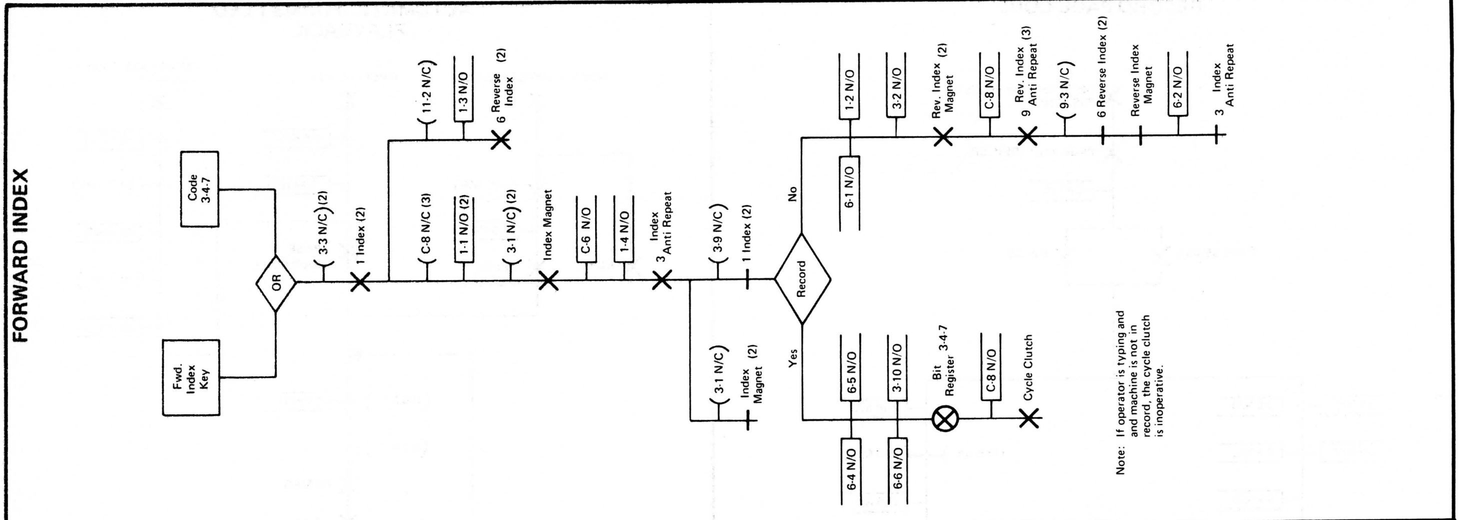
* If the customer's machine is wired for forms skip instead of single line carrier return, relay 5 (big bead) is picked via first line contact.

AUTOMATIC FORMS FEED PLAYBACK



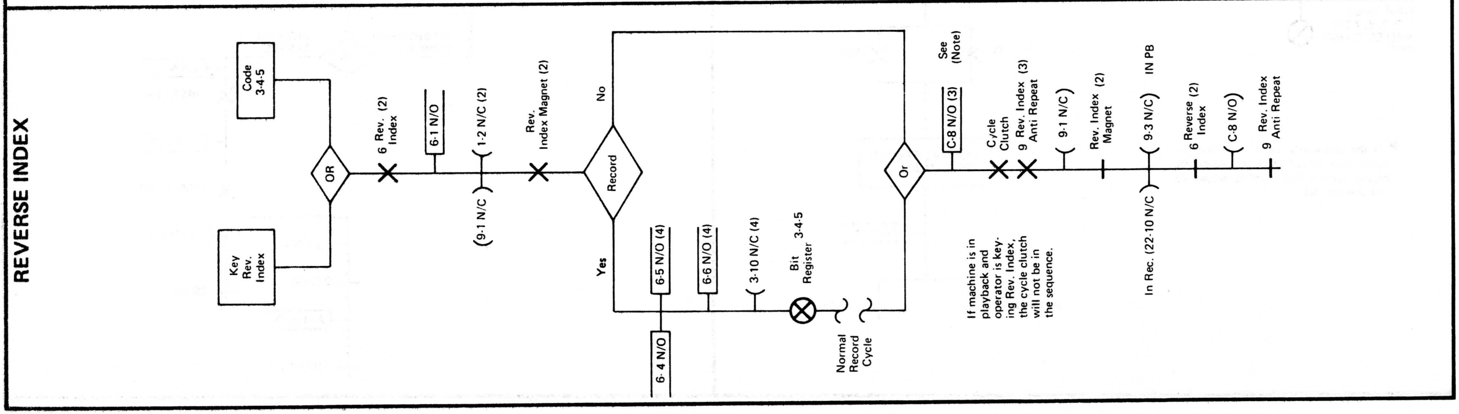
Reverse Index, Forward Index

FORWARD INDEX



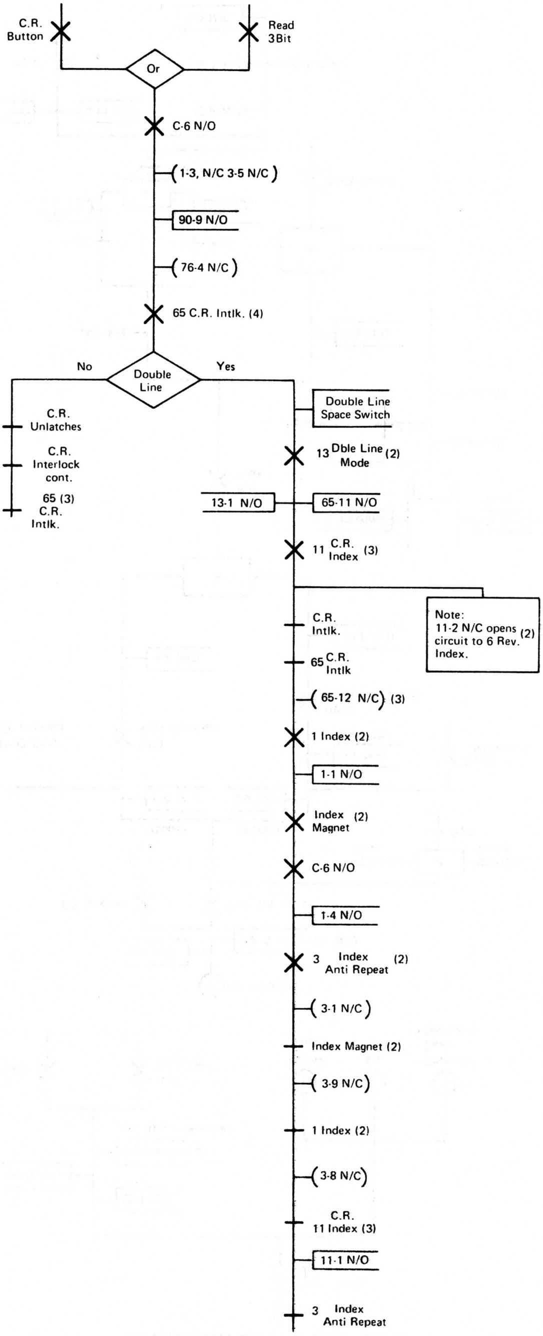
Note: If operator is typing and and machine is not in record, the cycle clutch is inoperative.

REVERSE INDEX

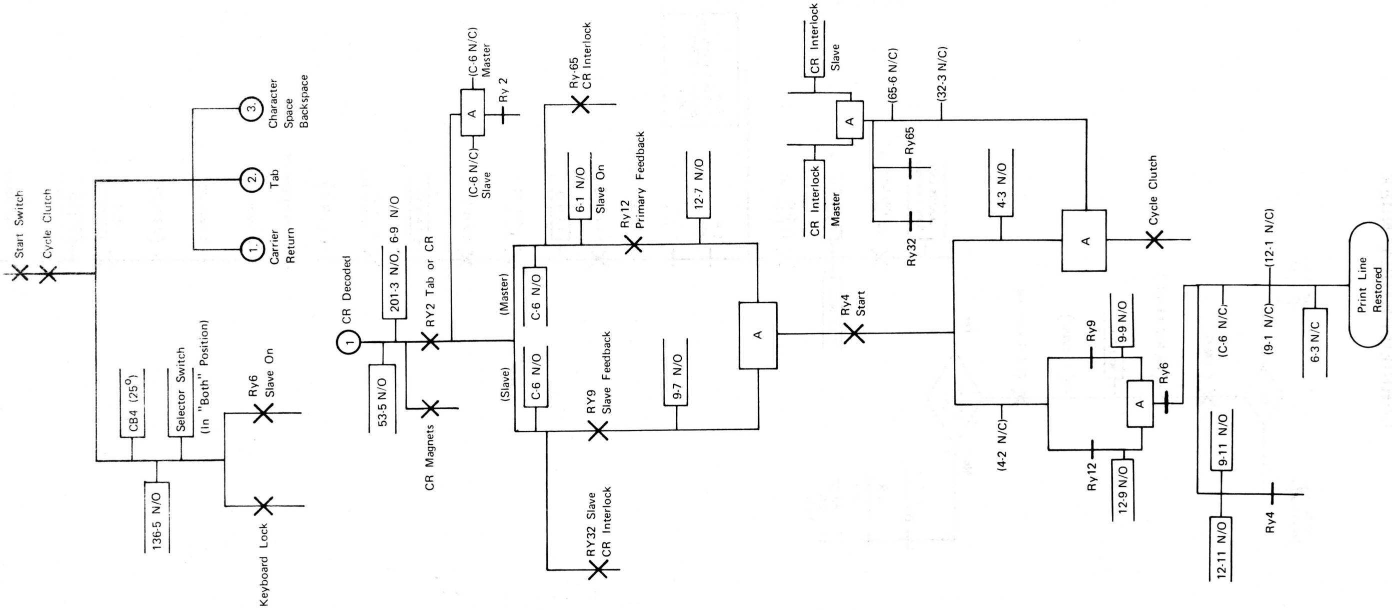


If machine is in playback and operator is keying Rev. Index, the cycle clutch will not be in the sequence.

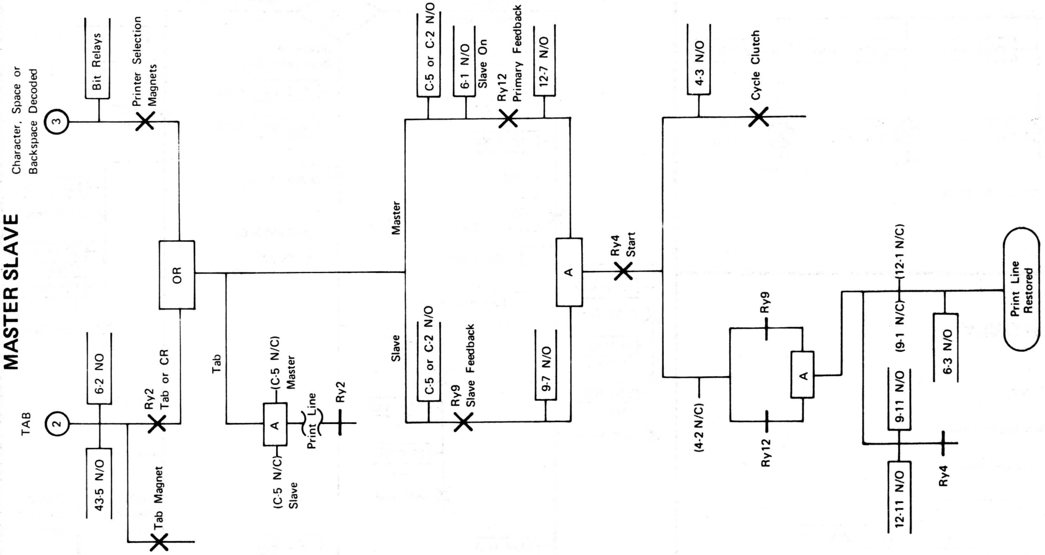
CARRIER RETURN INDEX



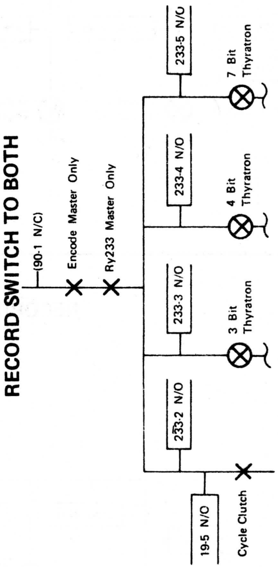
MASTER SLAVE PLAYBACK (THROUGH BOTH PRINTERS)



MASTER SLAVE

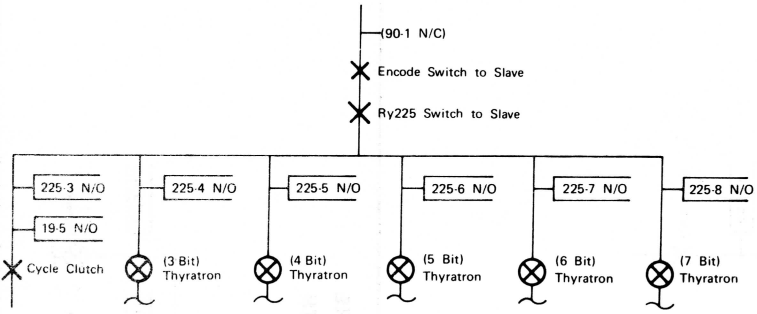


MASTER SLAVE
CODE CONTROL FEATURE
RECORD SWITCH TO BOTH



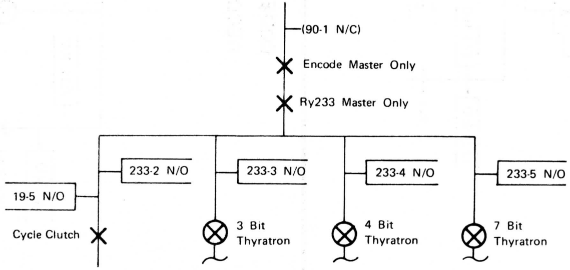
NORMAL RECORD OPERATION

RECORD SWITCH TO SLAVE



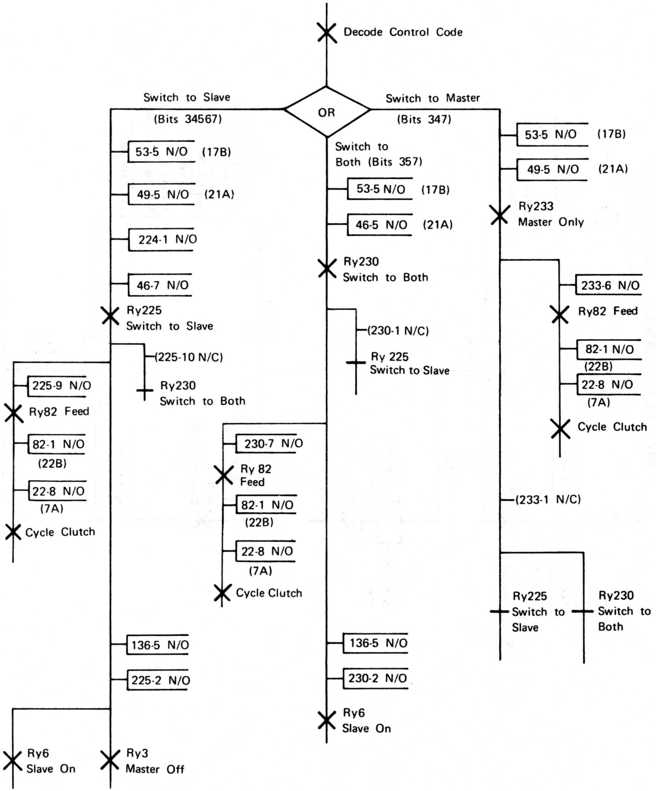
NORMAL RECORD OPERATION

RECORD MASTER ONLY

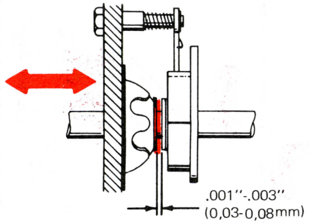


NORMAL RECORD OPERATION

CODE CONTROL FEATURE PLAYBACK

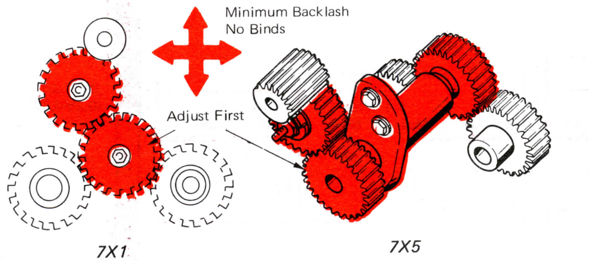


1 Cycle Shaft End Play (23-11)



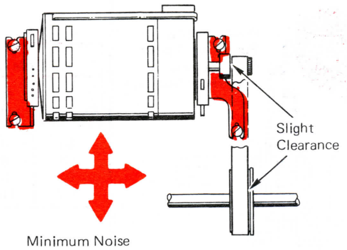
6

2 Idler Gears (23-54)

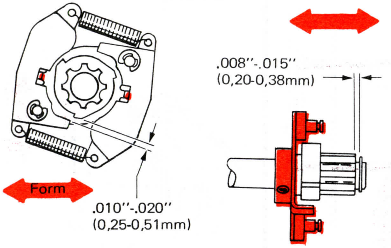


13, 91

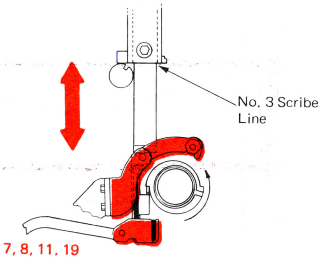
3 Motor And Drive Belt (11-68)



4 Motor Clutch (11-43)

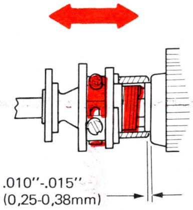


5 Cycle Clutch Latch Bracket (21-181)



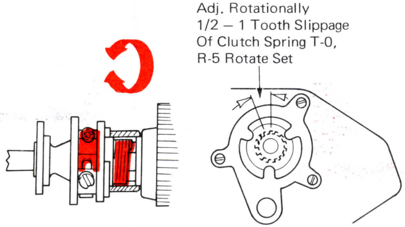
7, 8, 11, 19

6 Cycle Clutch (23-126)



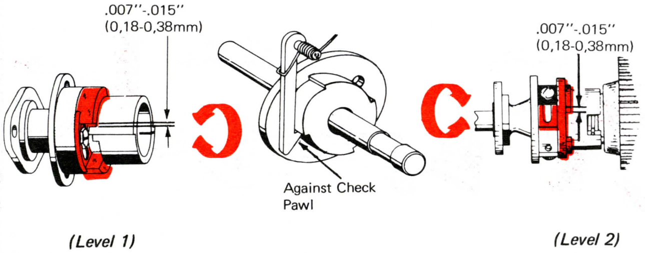
7, 8

7 Cycle Clutch Drive (23-126)

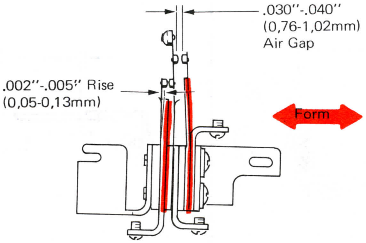


8

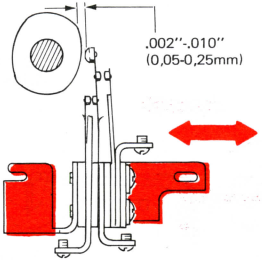
8 Cycle Clutch Overthrow Stop (23-44)



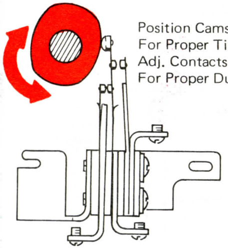
9 Print Feedback Contacts (C1 & C2) (27-100)



10 Contact Mounting Bracket (27-97)



11 C1 & C2 Cams (23-18)



Position Cams
For Proper Timing
Adj. Contacts
For Proper Duration

12 Timing Charts C1 & C2

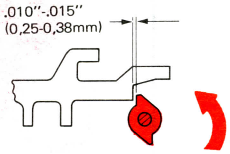
CAM CHART

Contact	N/O Duration	Color
C1	45°	Blue
C1	65°	Black
C2	90°	White
C2	110°	Orange

TIMING CHART (C-1 & C-2)

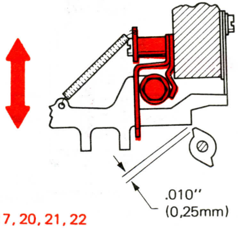
	C-1 N/O		C-2 N/C	
Machine	Make	Break	Break	Make
731	85° ± 3	130° ± 3	20° ± 3	120° ± 3
735	85° ± 3	130° ± 3	20° ± 3	120° ± 3
775 (MT/ST)	85° ± 3	130° ± 3	20° ± 3	120° ± 3

13 Filter Shaft (21-12)



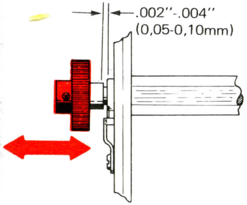
46, 144, 158, 176

14 Rear Interposer Guide Comb (21-200)

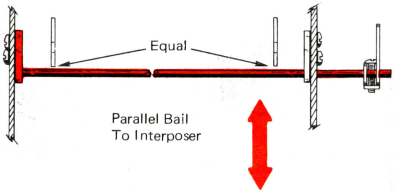


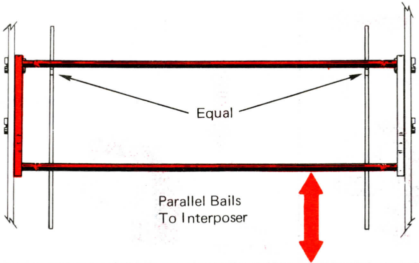
17, 20, 21, 22

15 Filter Shaft Gear (21-08)



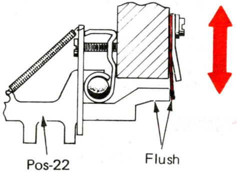
16 Selector Bail Plate (21-02)



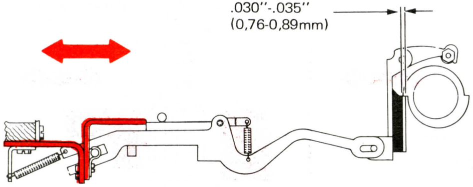


20, 22, 69.

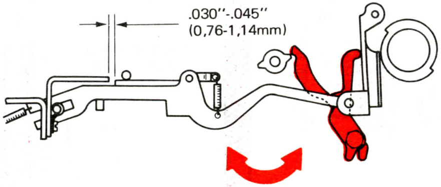
17 Latch Springs (Preliminary) (21-208)



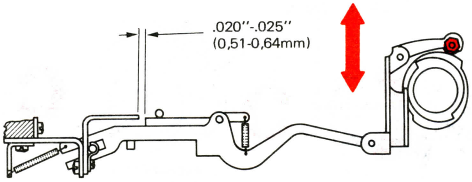
18 Keeper Bracket (21-97)



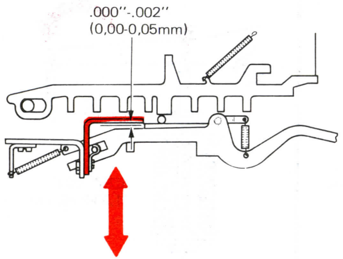
19 Cycle Clutch Restoring (21-92)



(21-40)

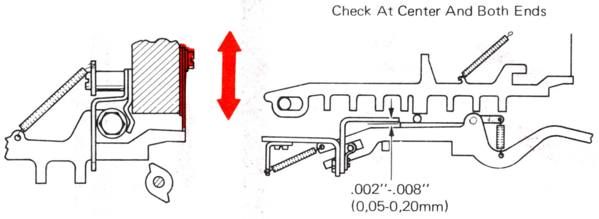


20 Cycle Clutch Pawl Keeper (21-96)



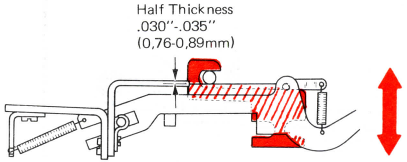
20, 22, 23

21 Latch Springs (Final) (21-208)

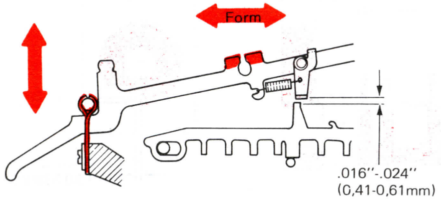


20

22 Cycle Bail Upstop (21-76)

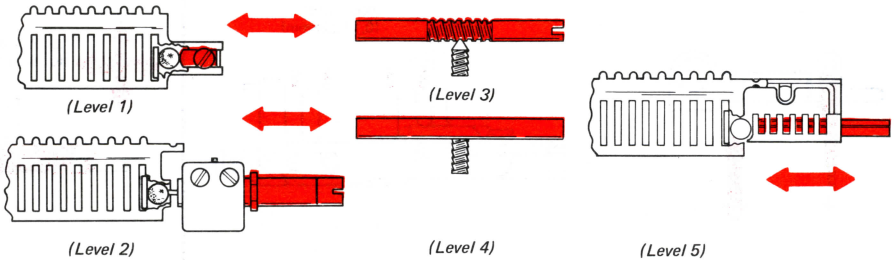


23 Front Keylever Guide Comb (21-256)

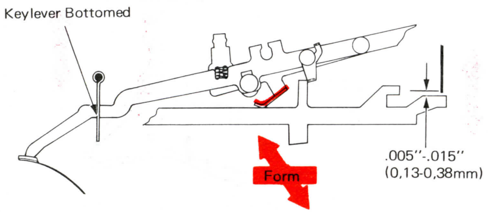


16, 184

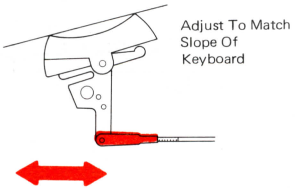
24 Compensator Tube (21-201)



25 Repeat Keylever (21-250)

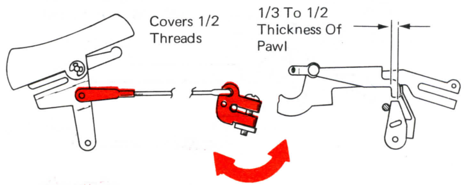


26 On/Off Link (11-62)

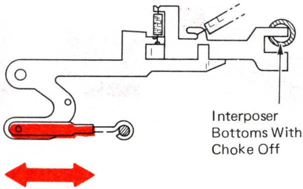


27

27 Lockout Bail Bellcrank Link (09-27)

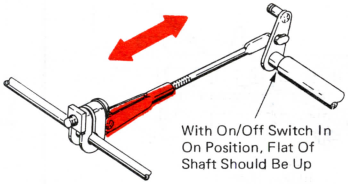


28 Keyboard Lock Bellcrank Link (09-112)



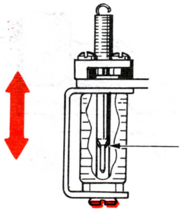
Interposer Bottoms Without Choke Off

29 Operational Lockout Link (09-104)



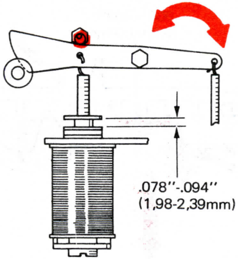
With On/Off Switch In On Position, Flat Of Shaft Should Be Up

30 Solenoid Adjustment (28-284)



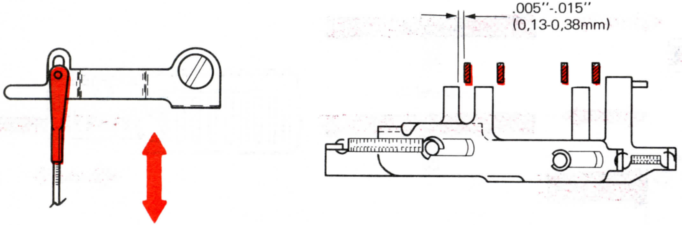
1/4 Turn Clearance

31 Eccentric Stop (10-14)



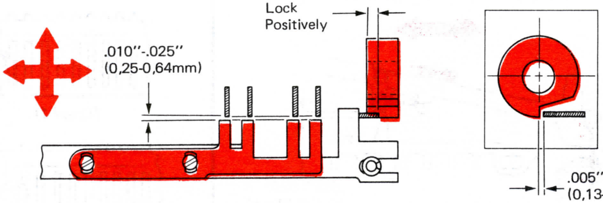
.078"-.094" (1,98-2,39mm)

32 Keyboard Lock Link (10-27)



.005"-.015" (0,13-0,38mm)

33 Spacebar Lock Cam & Lock Comb (Solenoid Operated) (10-87)

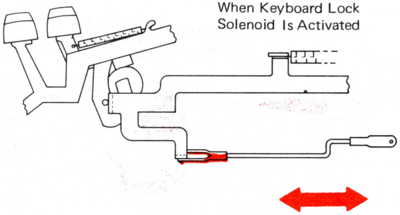


Lock Positively

.010"-.025" (0,25-0,64mm)

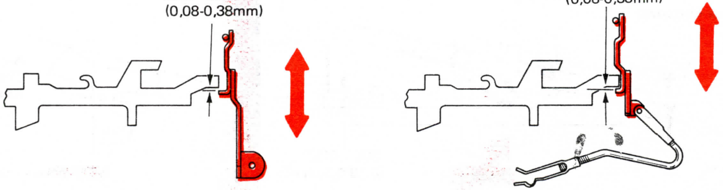
.005"-.015" (0,13-0,38mm)

34 Shift Lock Link (16-09)



Adjust To Unlatch Shift Lock When Keyboard Lock Solenoid Is Activated

35 Keyboard Interposer Link (10-03)



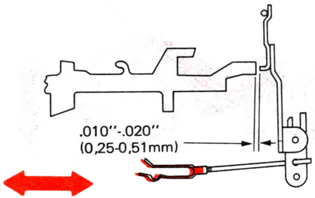
.003"-.015" (0,08-0,38mm)

(Level 1)

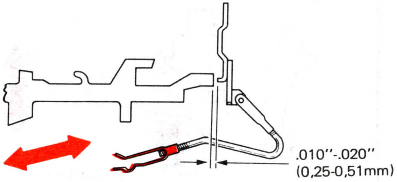
.003"-.015" (0,08-0,38mm)

(Level 2)

36 Interposer Lock Link (10-04)

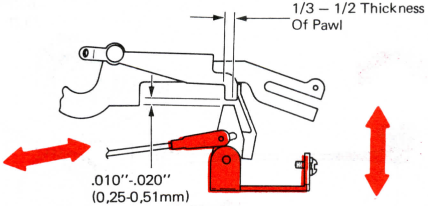


(Level 1)



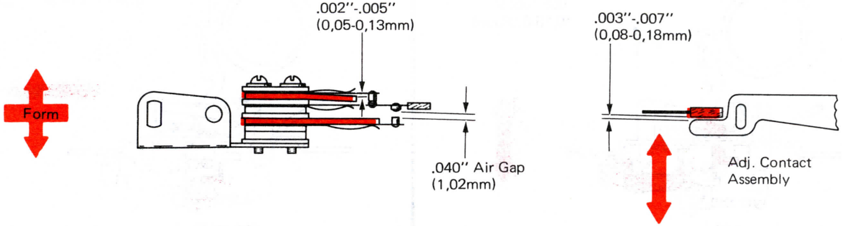
(Level 2)

37 Cycle Clutch Pawl Stop Link (10-57)

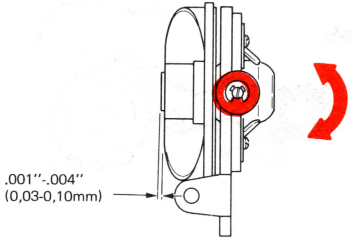


Solenoid Operated

38 Keyboard Mode Contacts (27-200)

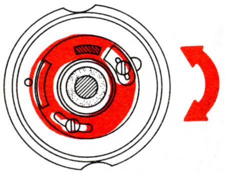


39 Shift Cam Backup Roller (16-46)

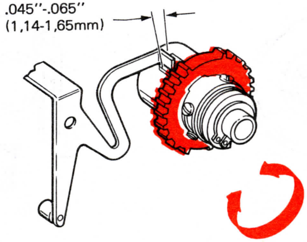


90

40 Shift Clutch Spring (16-65)

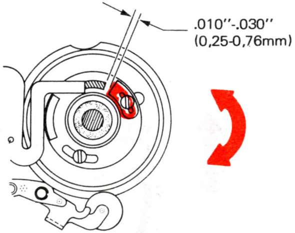


(Level 1)

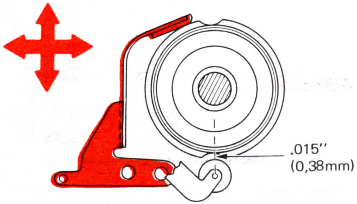


(Level 2)

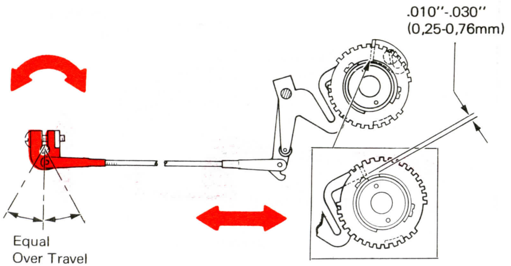
41 Shift Overthrow Stop (16-67)



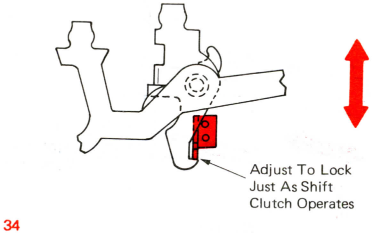
42 Shift Cam Brake (16-39)



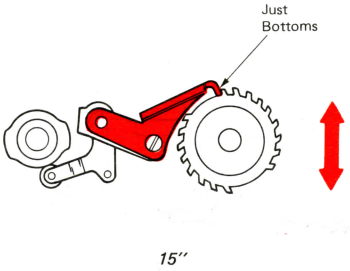
43 Shift Release (16-08)



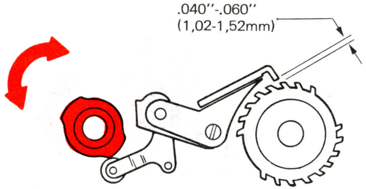
44 Shift Lock (16-24)



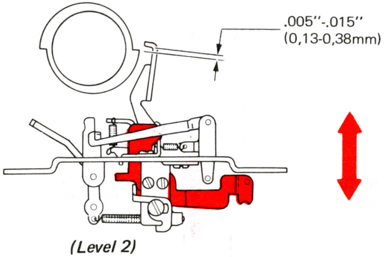
45 Shift Interlock (16-154)



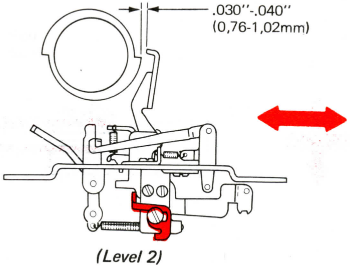
46 Shift Interlock Cam (16-153)



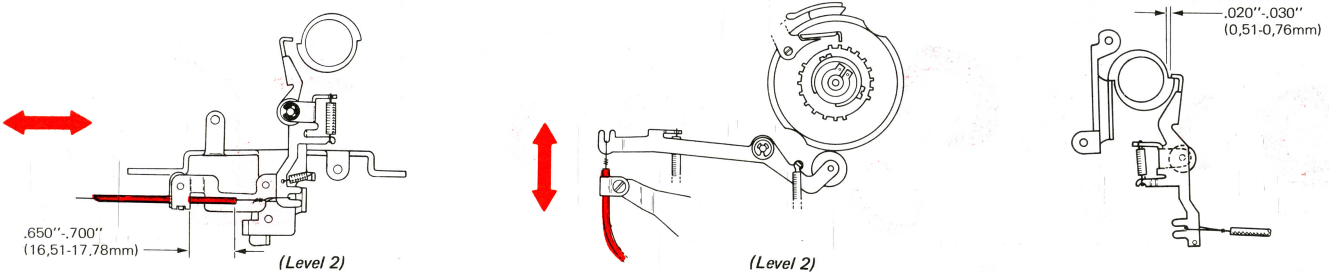
47 Cycle Clutch Interlock Arm Plate (21-159)



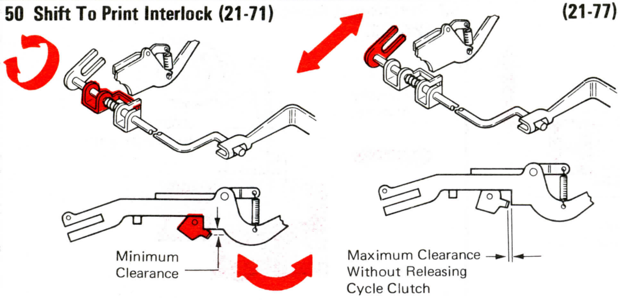
48 Cycle Clutch Interlock Stop (21-164)



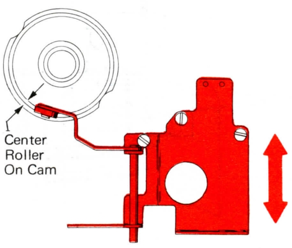
49 Cycle Clutch Interlock Cable Sheath (16-147)



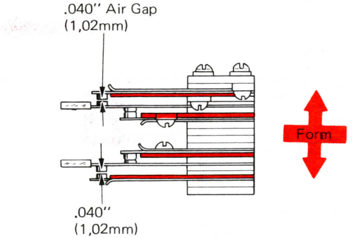
50 Shift To Print Interlock (21-71) (21-77)



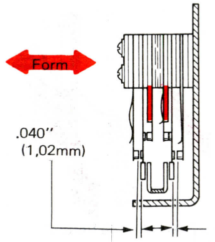
51 Contact Mounting Plate (27-130)



52 Shift Mode & C3-C4 (Preliminary) (27-121)



53 C3 & C4 Contacts (27-120)

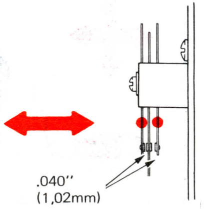


Shift	N/O Make	N/O Break
C3 & C4	35° ± 5	145° ± 5

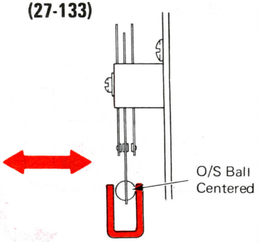
NOTE: Each shift operation is 180°

Transfer Time Should Be 3 Deg. To 9 Deg. On The Right Side Of The Cam

54 Transmitting Contacts (27-126)

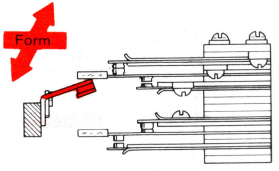


55 Contact Actuating Arm (27-133)



56 Mode Contact Actuating Arm (16-229)

Proper Contact timing



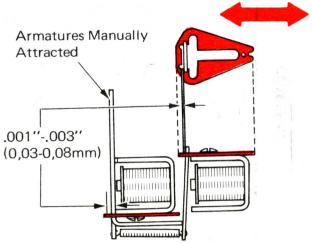
(Top View)

57 Contact Timing (Mode)

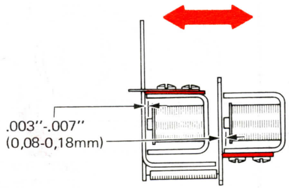
	N/O Make	N/O Break	
With Level 1 Character Interrupter	80° ± 10	100° ± 10	Mode 1
	130° ± 10	50° ± 10	Mode 2
With Level 2 Shift Interlock	100° ± 10	120° ± 10	Mode 1
	130° ± 10	87° ± 10	Mode 2

NOTE: Each Shift Operated Is 180 Deg.

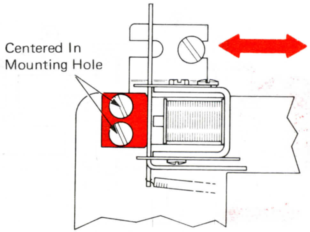
58 Hinge Plates (28-193)



59 Armature Stops (28-152)

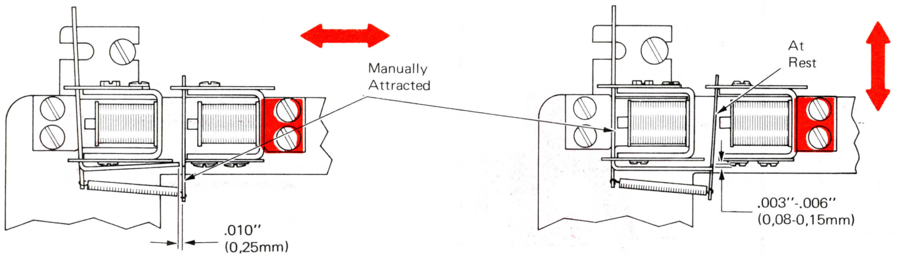


60 Upper Case Magnet (28-181)



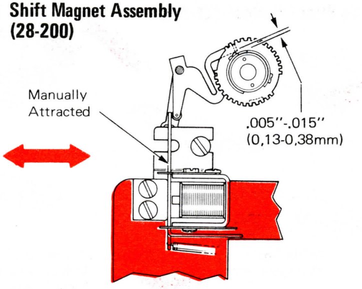
61, 62, 63

61 Lower Case Magnet (28-182)

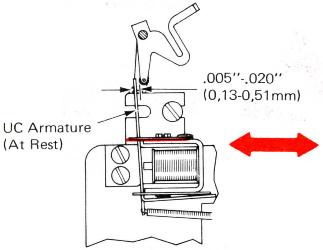


Satisfy Both Conditions

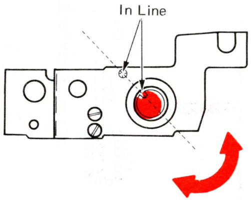
62 Shift Magnet Assembly (28-200)



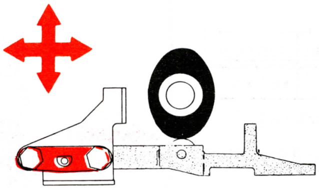
63 U.C. Armature Backstop (28-192)



64 Print Shaft Timing (Preliminary) (02-38)

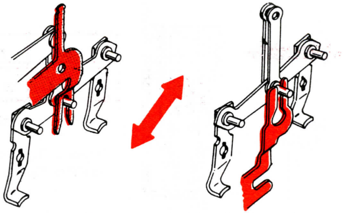


65 Latch Bail Shaft (23-167)



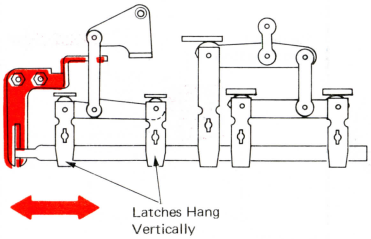
Bail Parallel To Cycle Shaft

66 Differential Guides (23-172)

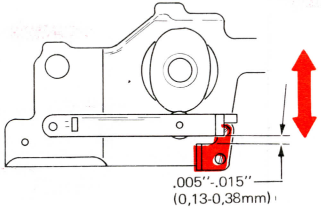


Differential Links Must Be Vertical

67 Positive Bail Guide (23-77)

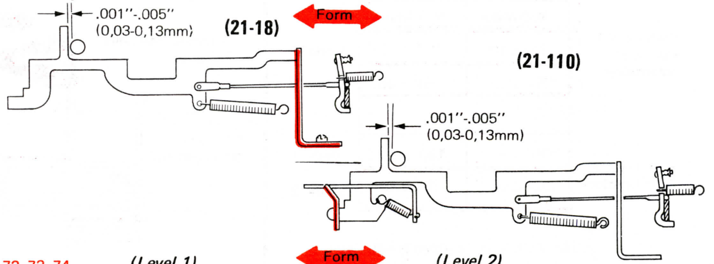


68 Selector Bail Overthrow Stop (23-14)



(Level 1 Only)

69 Interposer Latch Stop

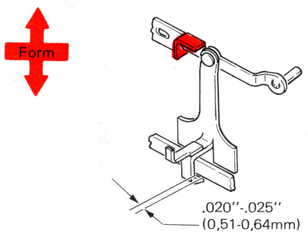


72, 73, 74

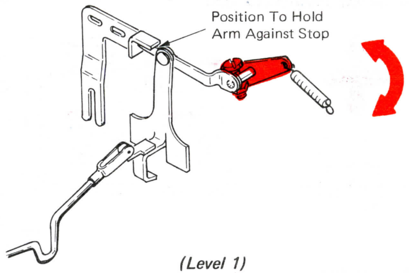
(Level 1)

(Level 2)

70 Check Latch Upstop (23-173)

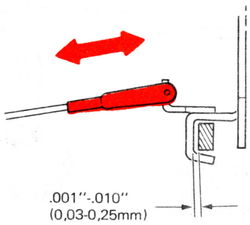


71 Check Latch Return Arm (23-93)

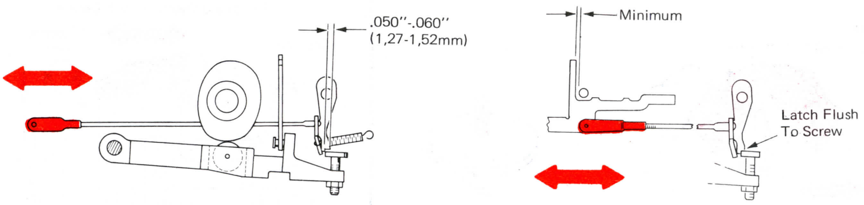


(Level 1)

72 Check Latch Link (21-14)



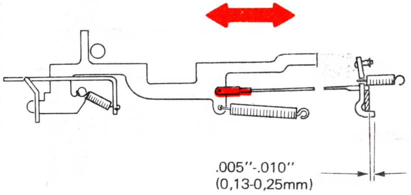
73 Negative 5 Latch Link (21-16)



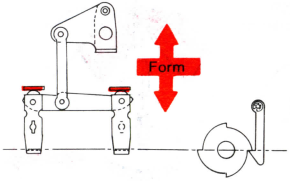
(Level 1)

(Level 2)

74 Selector Latch Links (21-16)

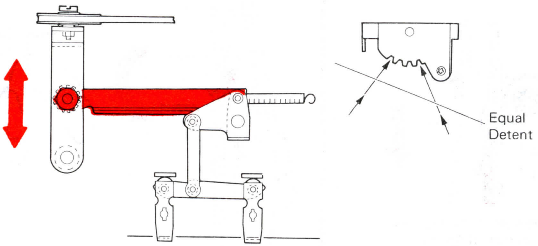


75 Tilt Latches (23-118)

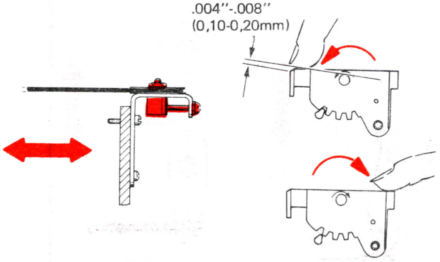


77 Check All Detenting Positions

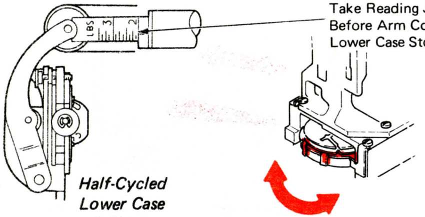
76 Tilt Arm Motion (23-79)



77 Tilt Ring Homing (23-05)



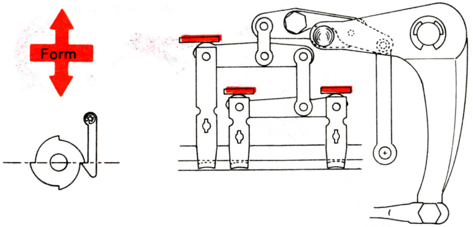
78 Rotate Spring Tension (02-278)



1 7/8 – 2 Lbs.
850 – 900 Grams
Take Reading Just
Before Arm Contacts
Lower Case Stop

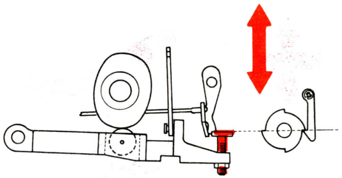
Half-Cycled
Lower Case
–5 Character
Typehead Removed

79 Rotate Latches (23-123)



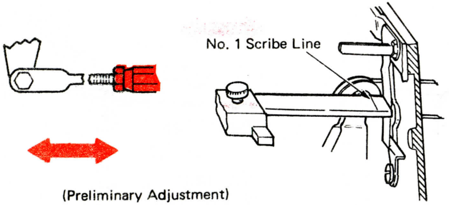
Check All Detenting Positions

80 Negative 5 Latch (23-134)



Check All Detenting Positions

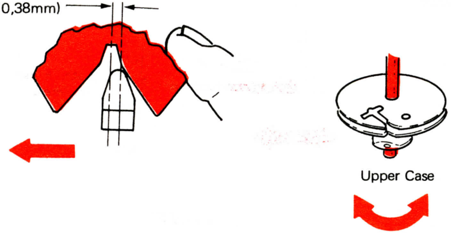
81 Rotate Arm Vertical (23-122)



(Preliminary Adjustment)

82 Coarse Homing (02-155)

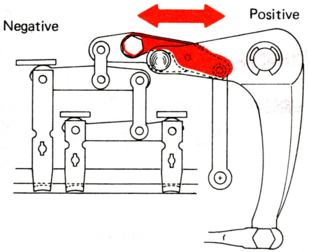
.015"
(0,38mm)



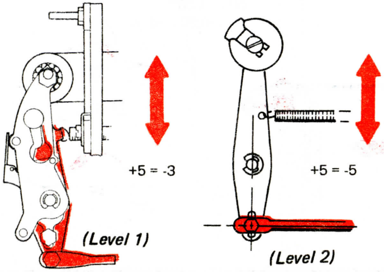
Upper Case

83 Balance Lever (23-120)

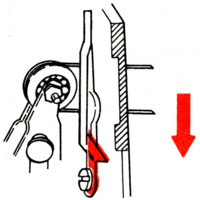
Rotate 0 Detent = +5/5 Detent



84 Rotate Arm Motion (23-71)

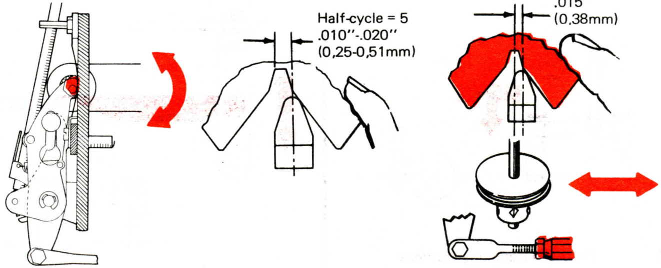


85 Damper Spring (Preliminary)(23-58)

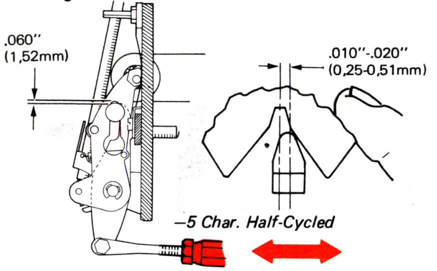


Move Damper Spring Stop
To Bottom Of Spring

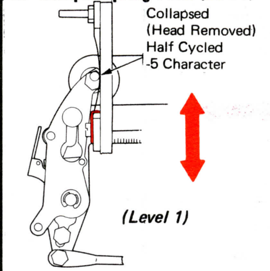
86 Fine Homing (23-49)



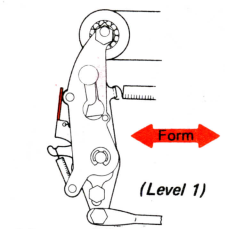
87 Wedge Position (23-122)



88 Damper Spring Final (23-58)

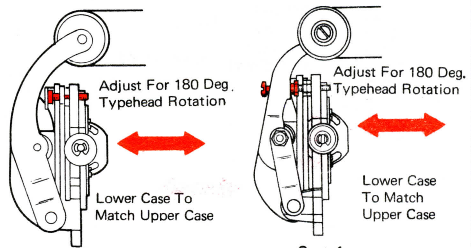


89 Ratio Change (23-45)



3 Detent = -5 Detent

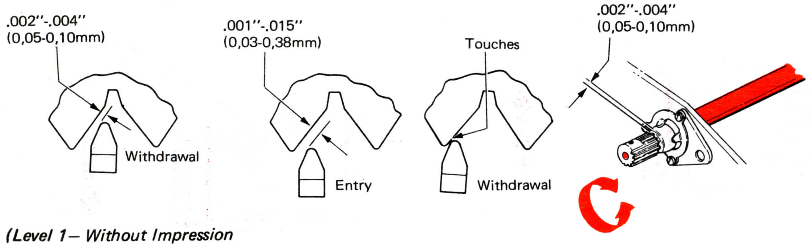
90 Shift Motion (16-49)



Stamped Shift Arm

Cast Arm

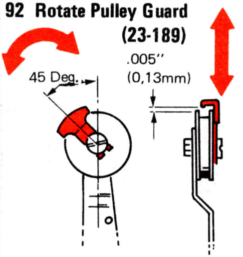
91 Print Shaft Timing (02-38)



(Level 1 – Without Impression Control)

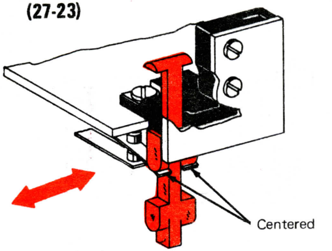
(Level 2)

92 Rotate Pulley Guard (23-189)

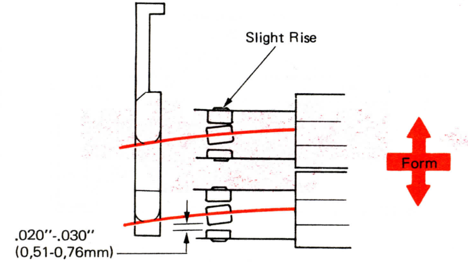


Carrier & Rocker Fine Alignment See Frame 111

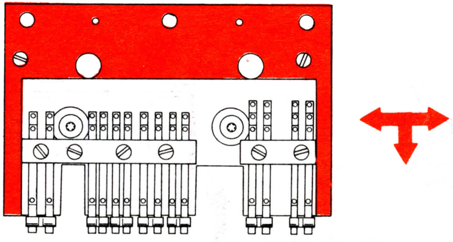
93 Selector Contact Actuator Guide (27-23)



94 Contact Straps (27-12)

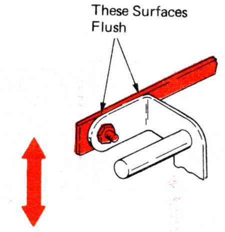


95 Selection Contact Mounting Plate (27-27)

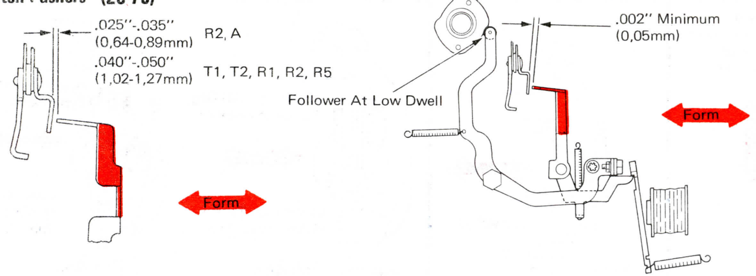


Clears Left Side Of –5 Bail

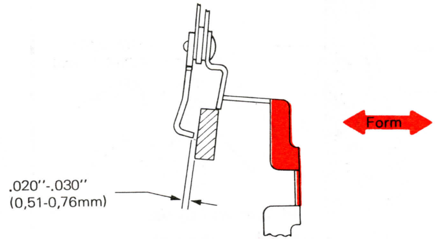
96 Pusher Bail Eccentrics (28-89)



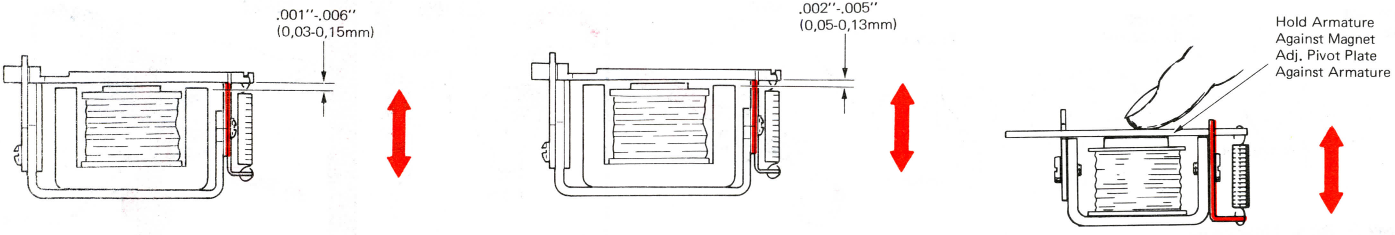
97 Latch Pushers (28-75)



98 Check Latch Pusher (28-76)

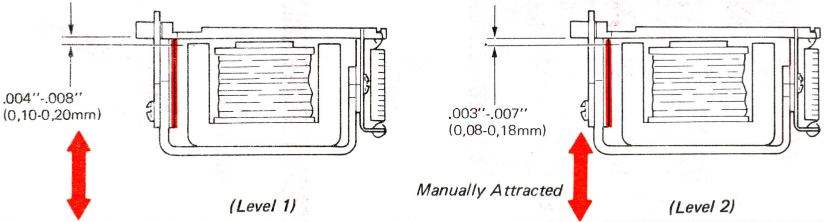


99 Pivot Plate (28-50)



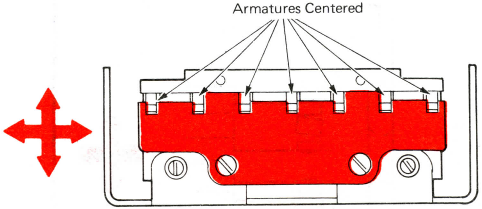
(Level 1) *Manually Attracted* *(Level 2)* *(Level 3)*

100 Armature Stop (28-44)



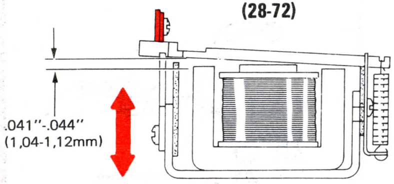
(Level 1) *Manually Attracted* *(Level 2)*

101 Armature Guide (28-19)

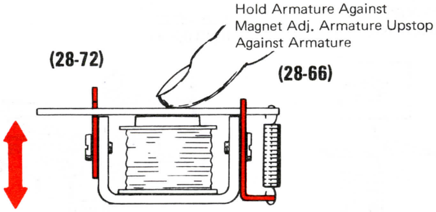


(Level 1)

102 Armature Upstop



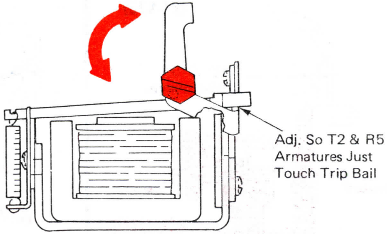
(Level 1 At Rest)



Hold Armature Against Magnet Adj. Armature Upstop Against Armature

(Level 3)

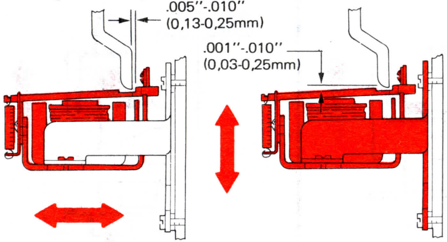
103 Pivot Eccentrics (28-69)



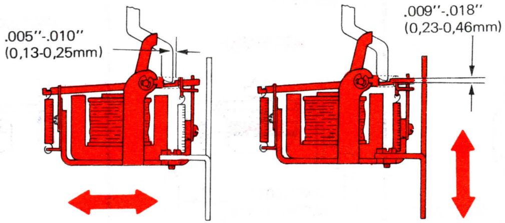
Adj. So T2 & R5 Armatures Just Touch Trip Bail

(Level 1 & Level 3 At Rest)

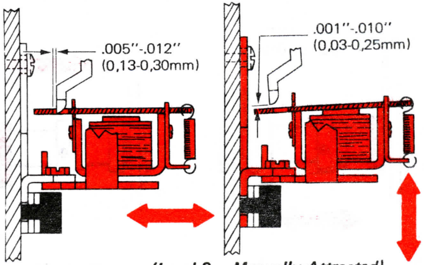
104 Magnet Unit (28-74)



(Level 1 At Rest)

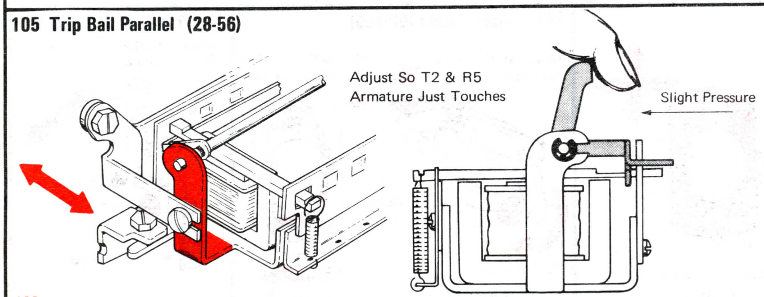


(Level 2 At Rest)



(Level 3 – Manually Attracted)

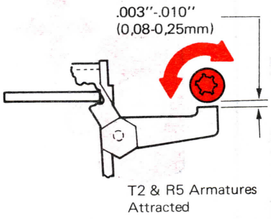
105 Trip Bail Parallel (28-56)



Adjust So T2 & R5 Armature Just Touches

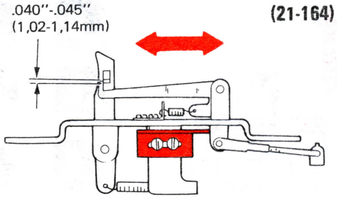
Slight Pressure

106 Knockoff Eccentrics (28-86)



T2 & R5 Armatures Attracted

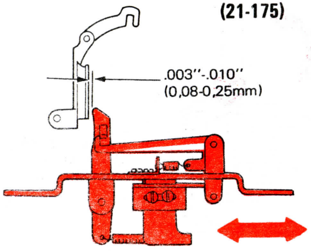
107 Latch Lever Stop (Mechanism Removed)



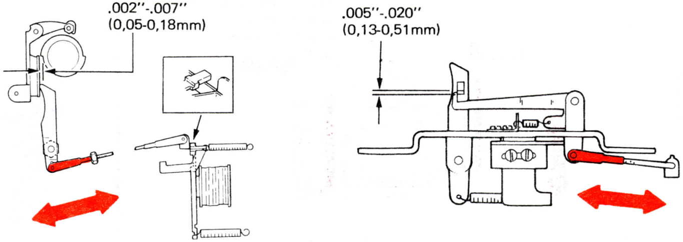
(Level 2)

Cycle Clutch Trip Mechanism, Fine Alignment

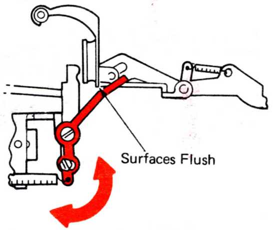
108 Trip Mechanism Mounting Bracket (21-175)



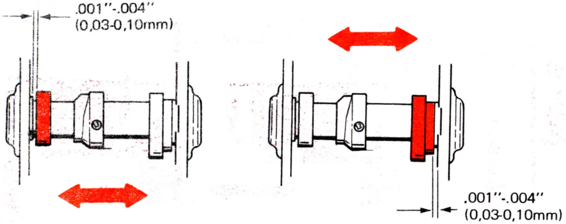
109 Cycle Clutch Trip Link (21-53)



110 Inhibitor (21-125)

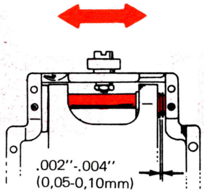


111 Print Sleeve End Play (02-48)

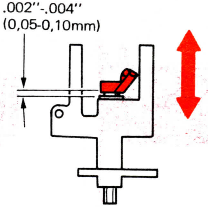


(Level 1) *(Level 2)*

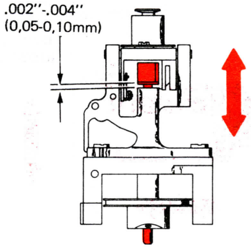
112 Rocker Shaft End Play (02-177)



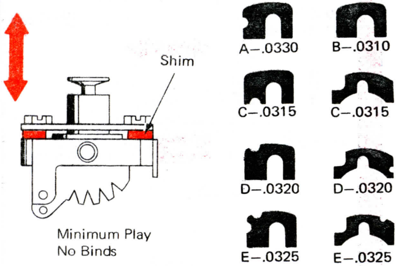
113 Tilt Tube End Play (02-190)



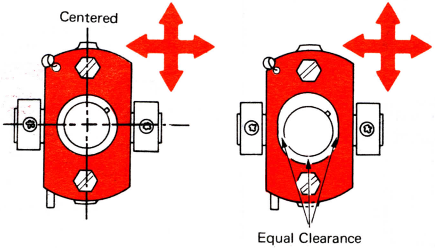
114 Rotate Shaft End Play (02-242)



115 Upper Ball Socket (02-206)

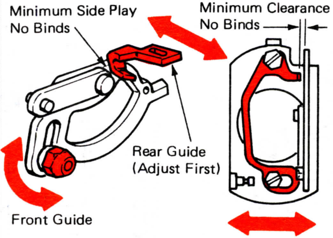


116 Tilt Ring Spacer (02-204)



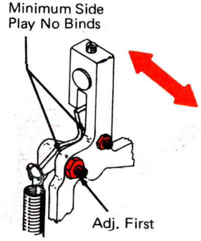
(Level 1) *(Level 2)*

117 Rotate Detent (02-198)



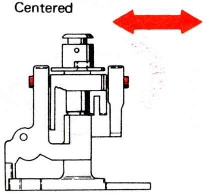
(Level 1) *(Level 2)*

118 Tilt Detent (02-213)

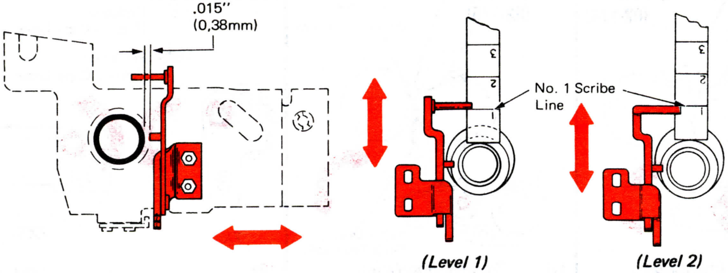


119 Tilt Ring Pivot Pins (02-187)

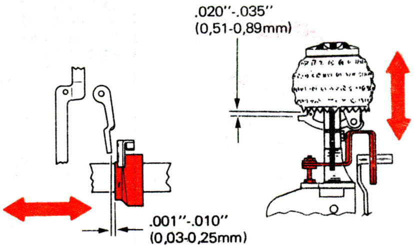
No End Play
No Binds
Centered



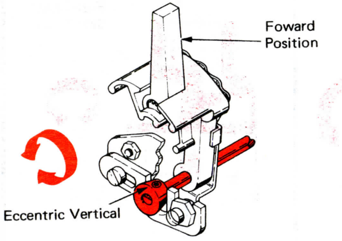
120 Detent Cam Follower Bracket (02-30)



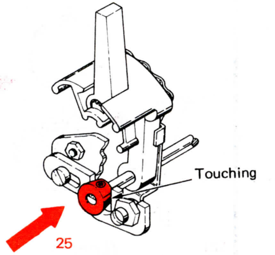
121 Detent Cam (02-247)



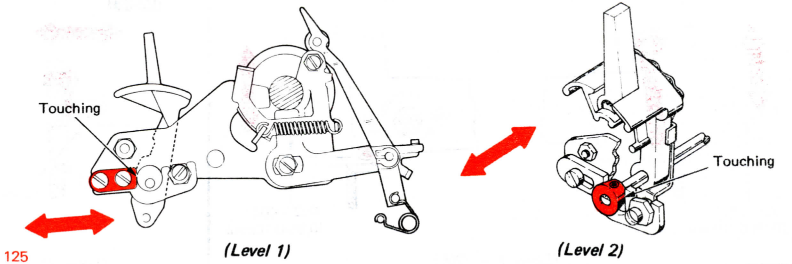
122 Copy Control Lever Shaft (22-12)



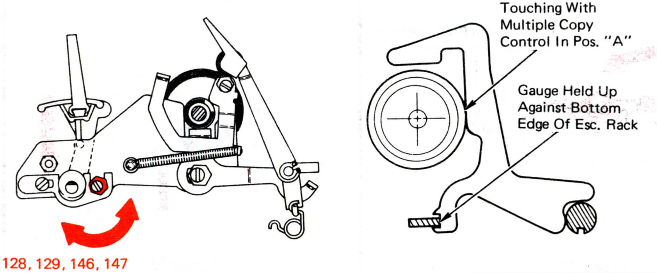
123 Copy Control Eccentric (22-12)



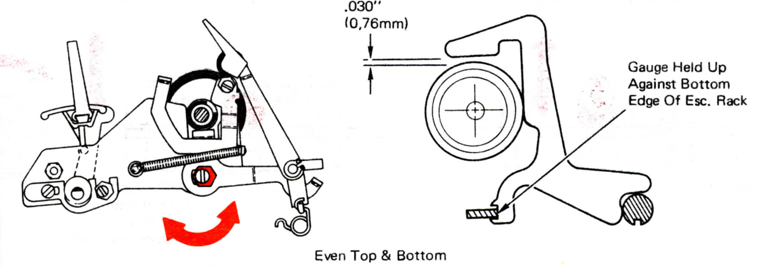
124 Platen Adjusting Plates (22-08)



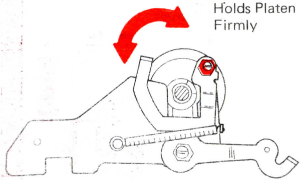
125 Platen Front-To-Rear (22-05)


Touching With Multiple Copy Control In Pos. "A"
Gauge Held Up Against Bottom Edge Of Esc. Rack
128, 129, 146, 147

126 Platen Height (22-27)



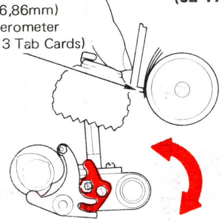
127 Platen Latches (22-10)



Holds Platen Firmly

128 Velocity Plate Binding Screw (02-176)

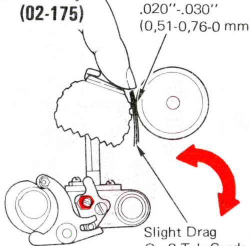
.260"-.270"
(6,60-6,86mm)
(Hooverometer
+2 Or 3 Tab Cards)



129 *Pre-Dual Impression*

129 Velocity Plate Eccentric (02-175)

.020"-.030"
(0,51-0,76-0 mm)



Slight Drag
On 3 Tab Cards

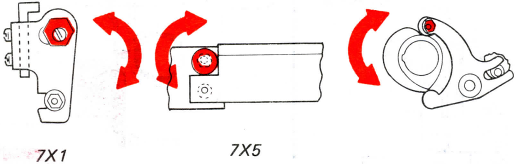
128 *Pre-Dual Impression*

130 Anvil (02-167)

No Period Or
Point – Copy Lever –5

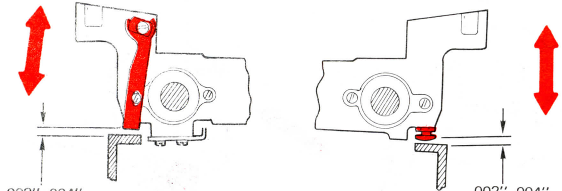
Light Period Or
Point – Copy Lever –4

Eccentric Up
Before Making
Adjustment



129 *(Level 1)*

131 Carrier Buffers (02-11) (02-47)

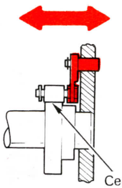


.002"-.004"
(0,05-0,10mm)

.002"-.004"
(0,05-0,10mm)

(Level 1 – 7X5)

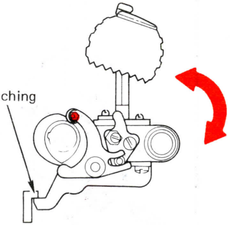
132 Print Cam Follower Stud (02-23)



Centered

(Level 1)

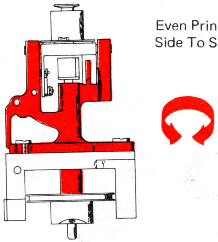
133 Cam Follower Eccentric & Yoke (02-167)



Touching

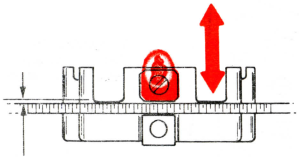
121 *(Level 1)*

134 Yoke Position (02-243)



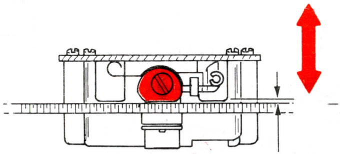
Even Print
Side To Side

135 Rear Carrier Shoe (02-26) (02-80)



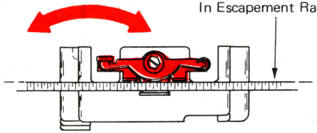
.001"-.004"
(0,03-0,10mm)

(Level 1)



.002"-.006"
(0,05,0,15mm)
With Spring
Pressure Removed

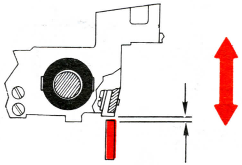
(Level 2)



Parallel With Pawl Centered
In Escapement Rack

(Level 3)

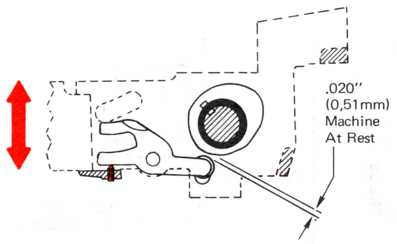
136 Carrier Support (02-94)



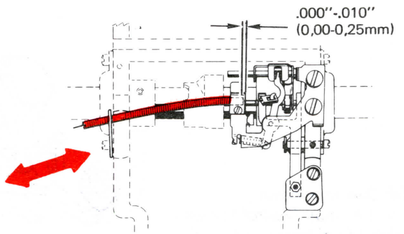
.001"-.004"
(0,03-0,10mm)

(Level 2)

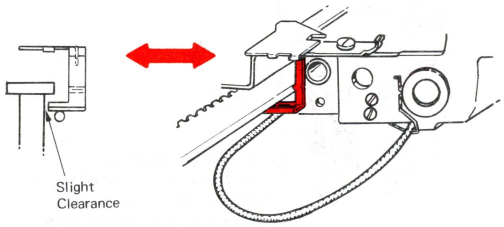
137 Print Cam Follower Stop (02-73)



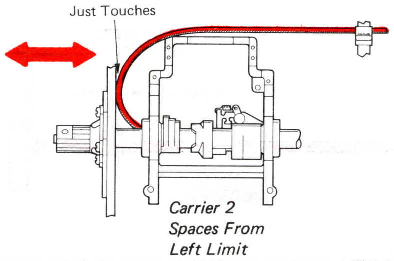
138 Velocity Control Cable (02-84)



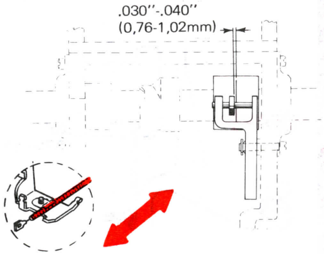
139 Velocity Cable Deflector (18-218)



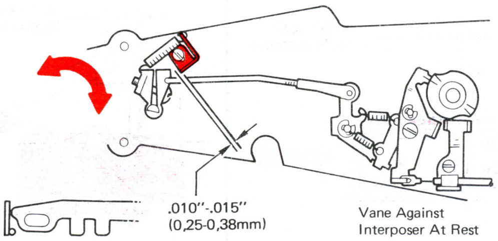
140 Center Cable Clamp (21-311)



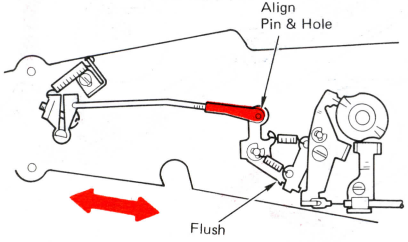
141 Cable Clamp (21-313)



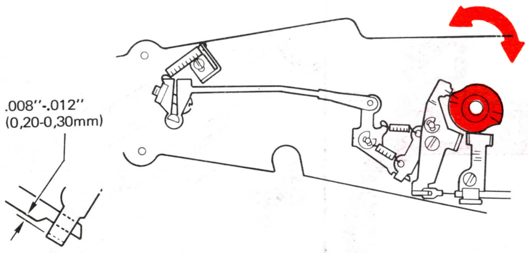
142 Low Velocity Vane Stop (21-361)



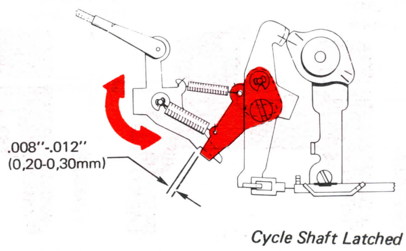
143 Low Velocity Latch Link (21-334)



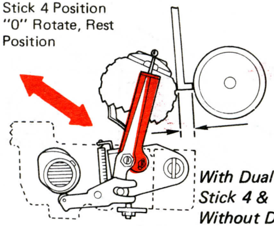
144 Low Velocity Cam (21-316)



145 Low Velocity Cam Follower Stop (21-329)



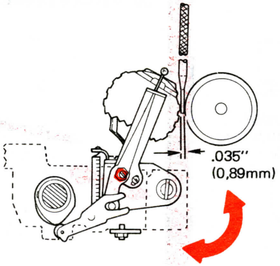
146 Powered Travel (02-259)



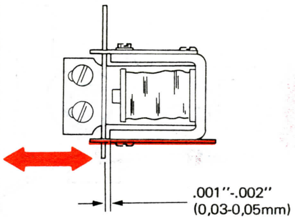
With Dual Impression
Stick 4 & Copy Control Forward
Without Dual Impression
Stick 5 & Copy Control Back

147 Free Flight (02-260)

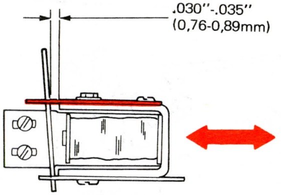
With Dual Impression
Stick 4 & Copy Control Forward
Without Dual Impression
Stick 5 & Copy Control At Pos. 4



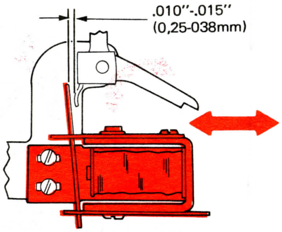
148 Dual Velocity Magnet & No Print Space Magnet (28-269)



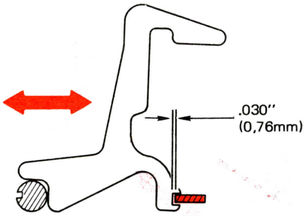
149 Magnet Backstop (28-265)



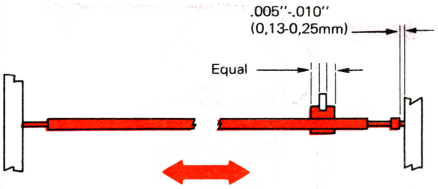
150 Magnet Assembly (28-260)



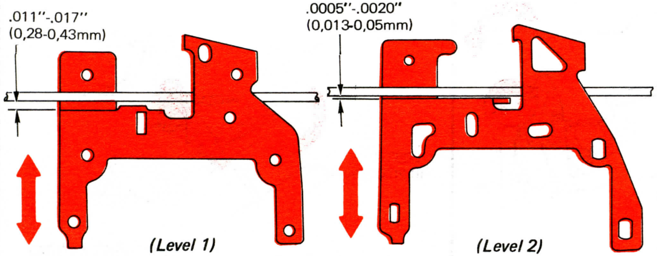
151 Escapement Rack (06-27)



152 Escapement Torque Bar (06-29)

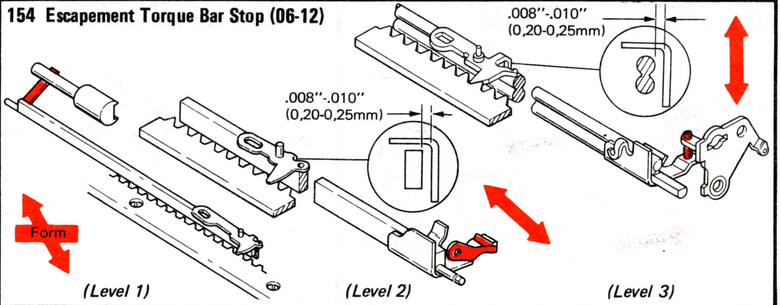


153 Escapement Bracket (06-23)



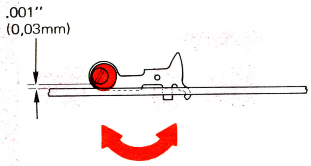
(Level 1) *(Level 2)*

154 Escapement Torque Bar Stop (06-12)



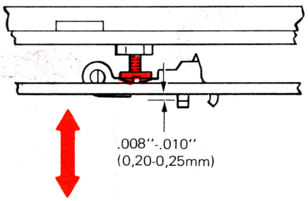
(Level 1) *(Level 2)* *(Level 3)*

155 Torque Bar Backup (06-26)



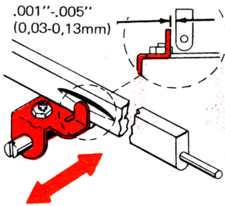
156

(Level 1 Only)



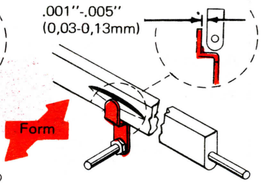
(Level 2)

156 Torque Bar Backstop (06-39)



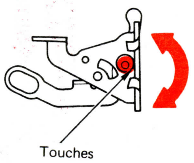
153, 155

(Level 1)



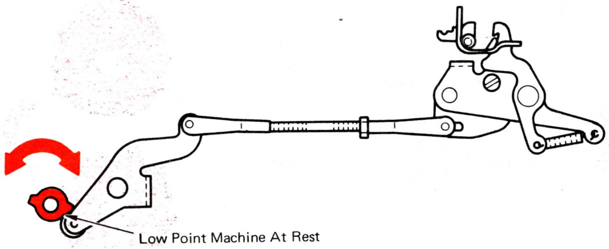
(Level 2)

157 Pivot Pin Eccentric (06-19)

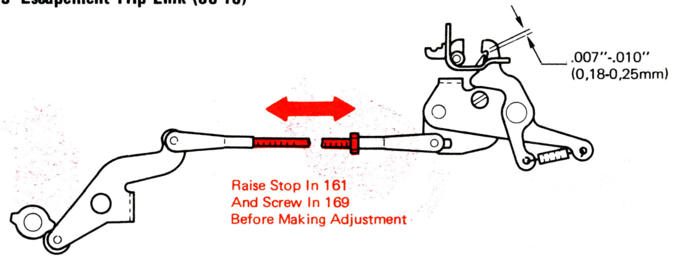


(Level 1)

158 Escapement Cam (06-07)



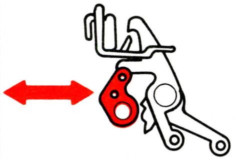
159 Escapement Trip Link (06-10)



Raise Stop In 161
And Screw In 169
Before Making Adjustment

Machine At Rest

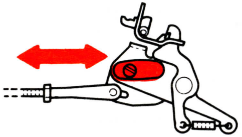
160 Trigger Knockoff (06-19)



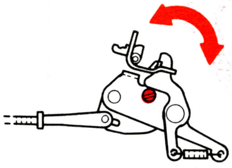
When Pawl Clears
Rack By .010"-.015"
(0,25-0,38mm)

159, 160

(Level 1)

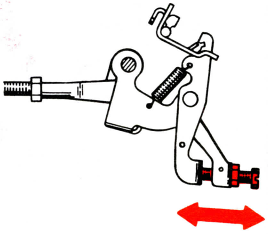


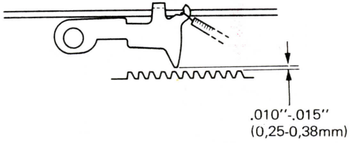
11" Machines



15" Machines

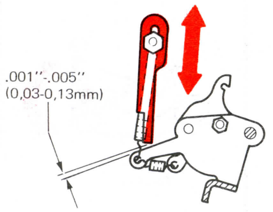
(Level 2)



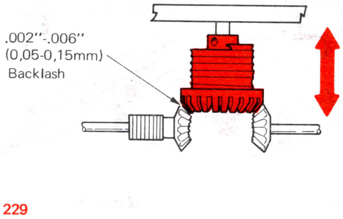


(Level 3)

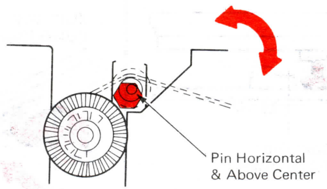
161 Trigger Lever Upstop (06-36)



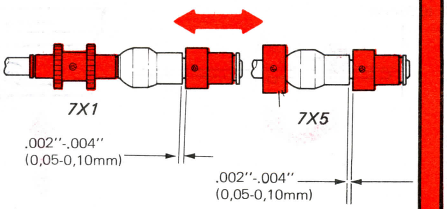
162 Cord Drum (18-01)



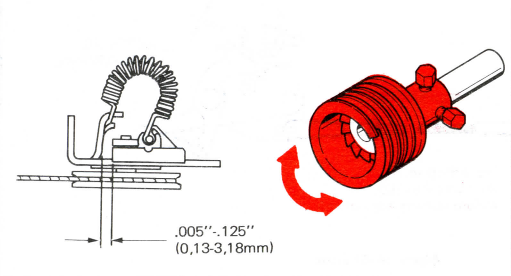
163 Eccentric Mounting Stud (18-26)



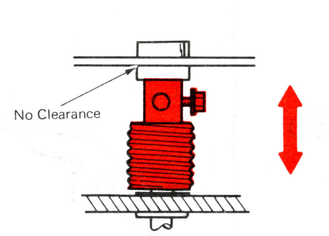
164 Operational Shaft End Play (25-33)



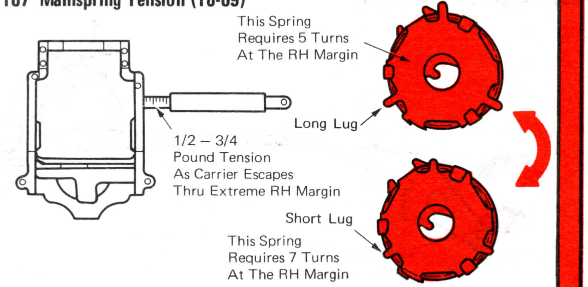
165 Cord Tension (03-31)



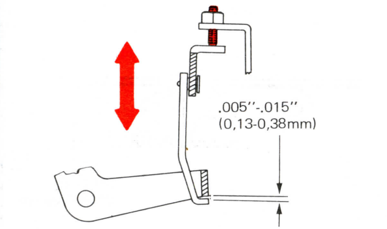
166 Carrier Return Cord Drum (03-31)



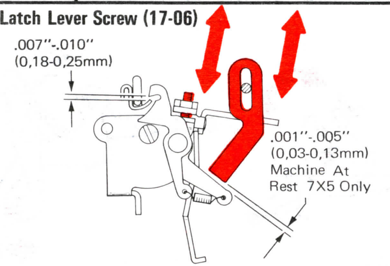
167 Mainspring Tension (18-09)



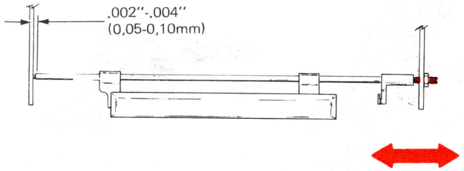
168 Operational Latch Height (Other) (17-02)



169 Latch Lever Screw (17-06)

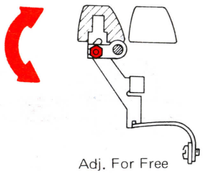


170 Spacebar Shaft (17-23)



171 Spacebar Guides

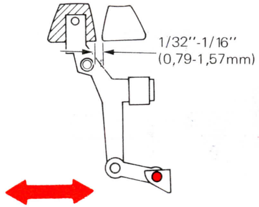
(17-60)



Adj. For Free Travel

(Level 1)

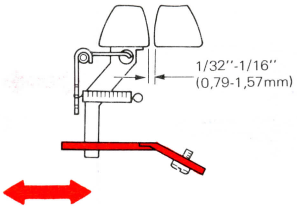
(17-16)



1/32"-1/16"
(0,79-1,57mm)

(Level 2)

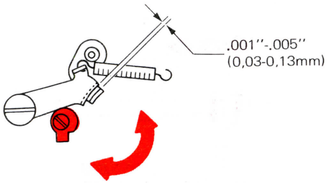
(17-101)



1/32"-1/16"
(0,79-1,57mm)

(Level 3)

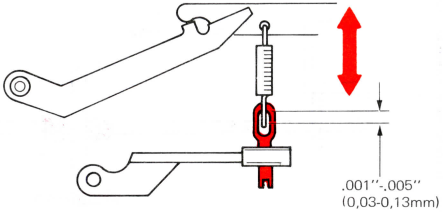
172 Spacebar Repeat Stop



.001"-.005"
(0,03-0,13mm)

(Level 1)

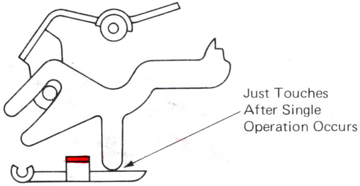
(17-70)



.001"-.005"
(0,03-0,13mm)

(Level 2)

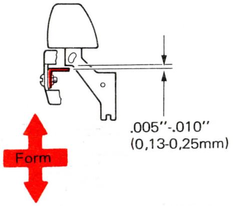
(17-91)



Just Touches
After Single
Operation Occurs

(Level 3)

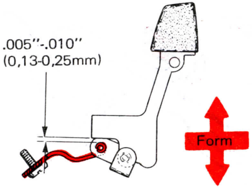
173 Final Stop (17-61)



.005"-.010"
(0,13-0,25mm)

(Level 1)

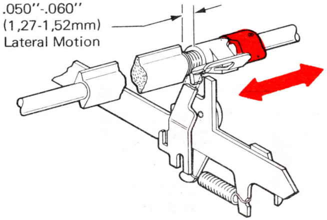
(17-19)



.005"-.010"
(0,13-0,25mm)

(Level 2)

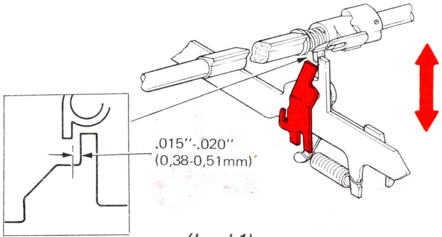
174 Space To Print (17-47)



.050"-.060"
(1,27-1,52mm)
Lateral Motion

(Level 1)

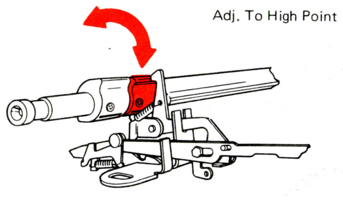
175 Lockout Cam Guide (17-49)



.015"-.020"
(0,38-0,51mm)

(Level 1)

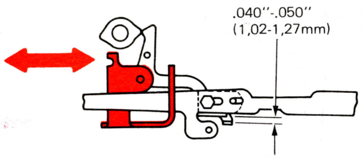
176 Spacebar Interlock Cam (17-10)



177

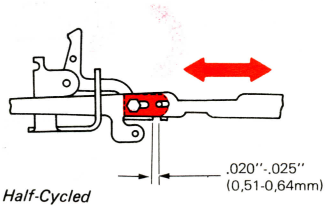
(Level 2 — Machine At Rest)

177 Spacebar Interlock Bracket (17-11)



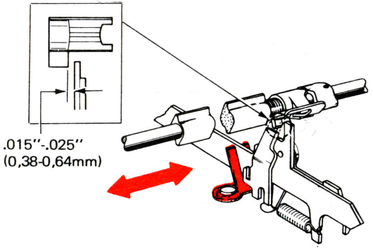
(Level 2)

178 Spacebar Interlock Stop (17-07)



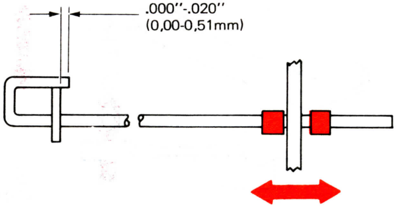
Machine Half-Cycled
Interposer At Rest *(Level 2)*

179 Spacebar Interposer Guide (17-66)



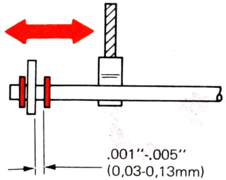
(Level 1)

180 Spacebar Interlock Bail (21-167)



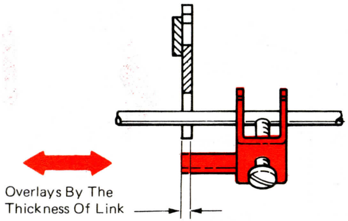
(Level 1)

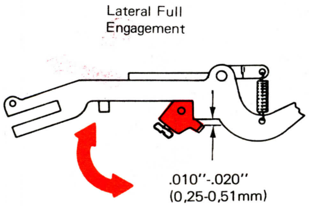
(21-167)

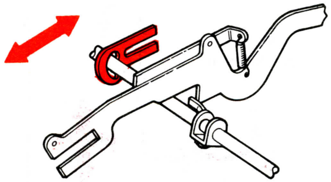


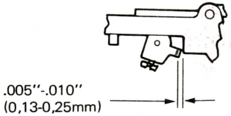
(Level 2)

181 Interlock Pawl (21-155)

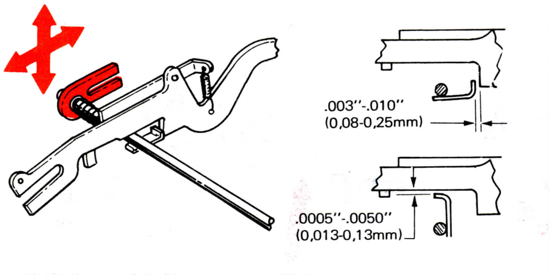




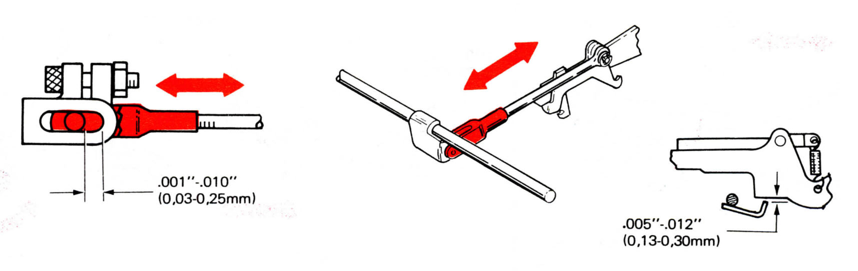




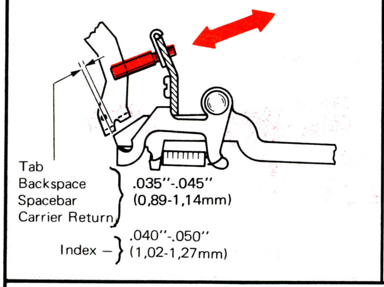
181 Interlock Pawl (Cont'd.) (21-154)



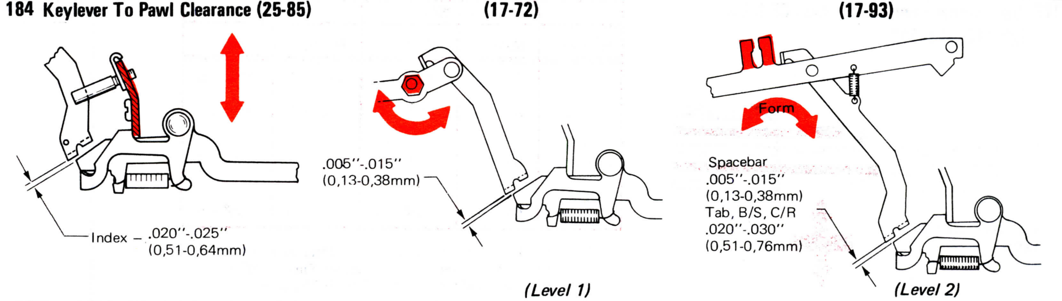
182 Spacebar Interlock Link (21-174)



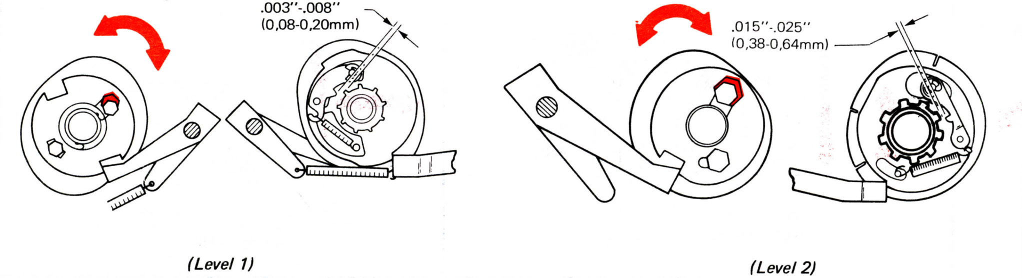
183 Operational Control (25-17)



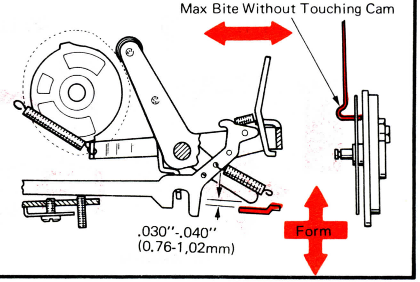
184 Keylever To Pawl Clearance (25-85)



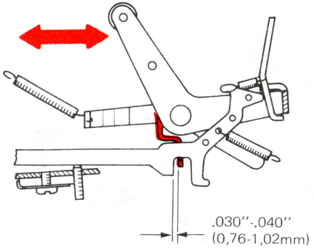
185 Cam Check Ring (25-26)



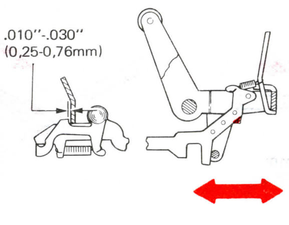
186 Release Arm Stop Pad (25-02)



187 Clutch Release Arm (25-12)

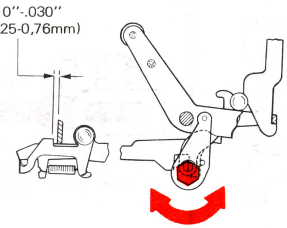


188 Interposer Restoring Bail (25-32)



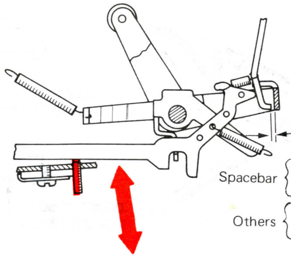
(Level 1)

(25-88)

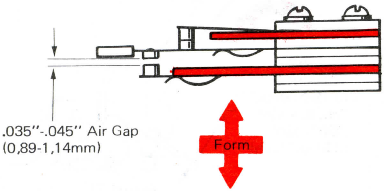


(Level 2)

(25-24)


Spacebar { .025"-.035" (0,64-0,89mm)
Others { .015"-.020" (0,38-0,51mm)

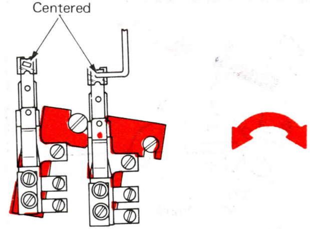
189 Operational Feedback Contact C5 & C6 (27-110, 111, 112)



	C-5 N/O		C-6 N/O	
Machine	Make	Break	Make	Break
731	55° ± 5	130° ± 5	170° ± 5	305° ± 5
735	55° ± 5	130° ± 5	170° ± 5	305° ± 5
775 (MT/ST)	55° ± 5	130° ± 5	170° ± 5	305° ± 5
655 (MT/SR)	65° ± 5	125° ± 5	170° ± 5	305° ± 5

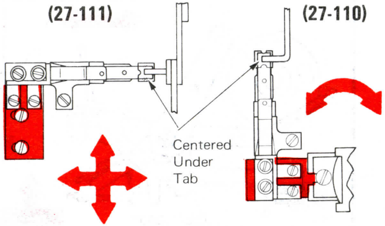
C-5 Transfer Time Is 10° To 20° Measured On The Rise Side Of The Cam C-6 Transfer Time Is 20° To 40° Measured On The Rise Side Of The Cam

190 Operational Contacts Positioning (C5 & C6) (27-112)



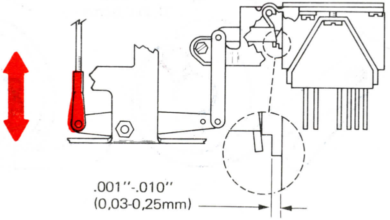
11" Machines

190 Operational Contacts Positioning (Cont'd) (C5 & C6)

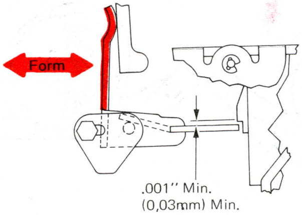


15" Machine

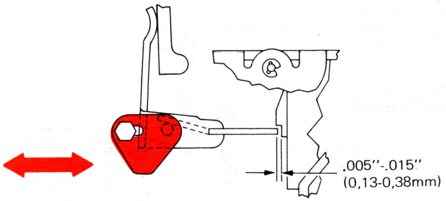
191 Operational Links (25-303)



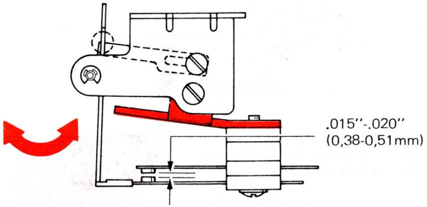
192 Contact Latches (27-47)



193 Adjusting Plate (27-45)

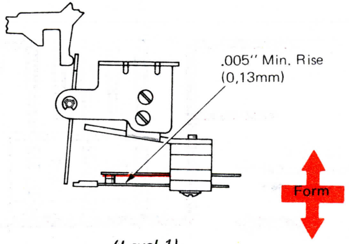


194 Contact Air Gap (27-67)



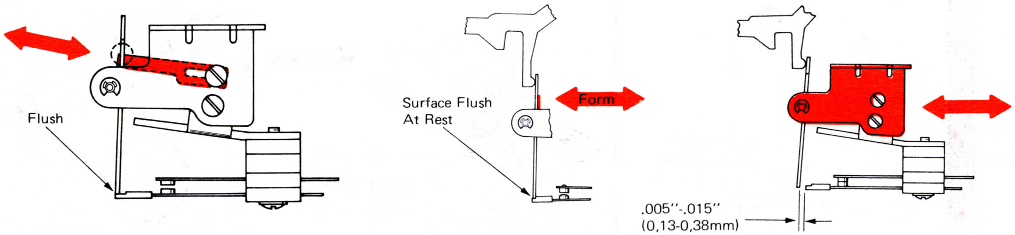
(Level 1)

195 N/O Contact Rise (27-68)



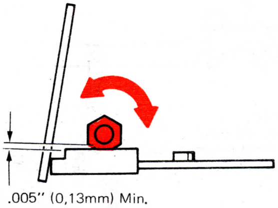
(Level 1)

196 Contact Latches (27-78)



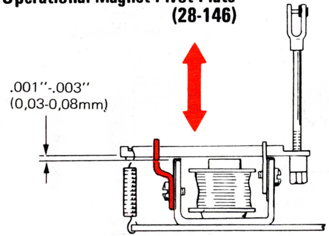
(Level 1)

197 Bail Eccentrics (Final) (27-325)



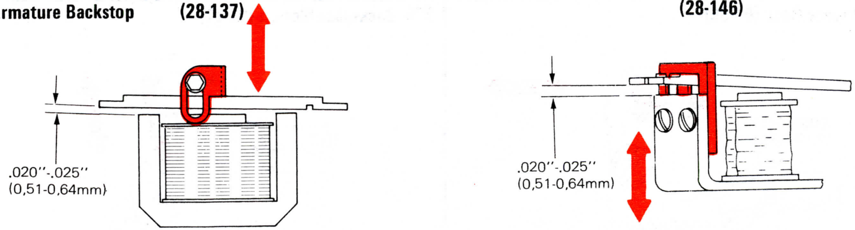
Cam On Its High Point

198 Operational Magnet Pivot Plate (28-146)



Manually Attracted

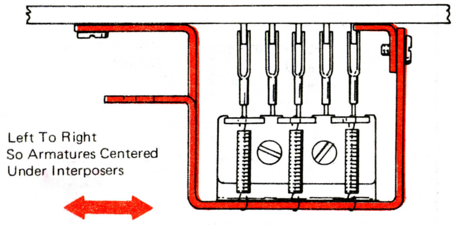
199 Armature Backstop (28-137)



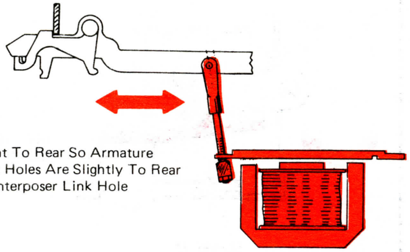
(Level 1 — At Rest)

(Level 2 – At Rest)

200 Operational Magnet Unit (28-140)



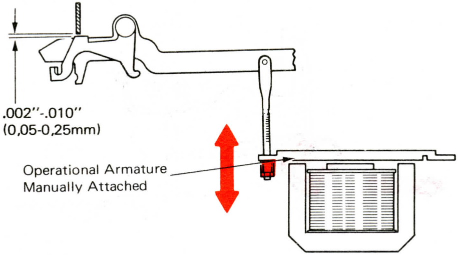
Left To Right So Armatures Centered Under Interposers



Front To Rear So Armature Link Holes Are Slightly To Rear Of Interposer Link Hole

201

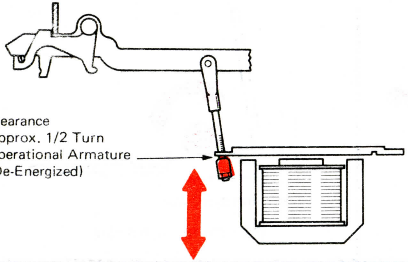
201 Magnet Pull Links (28-101)



.002"-.010" (0,05-0,25mm)

Operational Armature Manually Attached

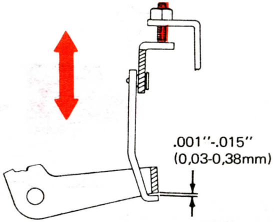
201 Magnet Pull Links (Cont'd) (28-101)



Clearance Approx. 1/2 Turn

Operational Armature (De-Energized)

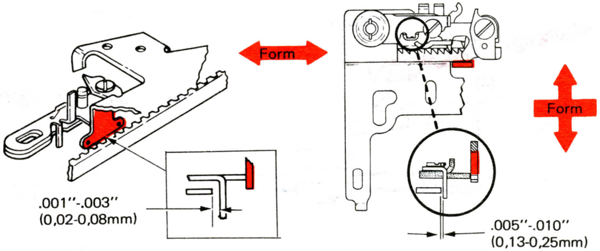
202 Latch Height (Backspace) (01-09)



.001"-.015" (0,03-0,38mm)

204, 205

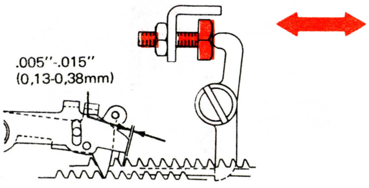
203 Tab Lever Stop (06-23)



.001"-.003" (0,02-0,08mm)

.005"-.010" (0,13-0,25mm)

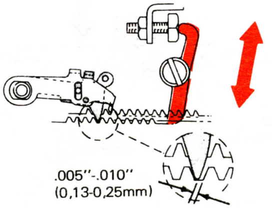
204 Backspace Rack (01-06)



.005"-.015" (0,13-0,38mm)

205

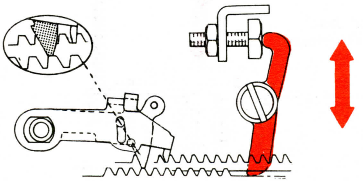
205 Backspace Motion (01-11)



.005"-.010" (0,13-0,25mm)

204

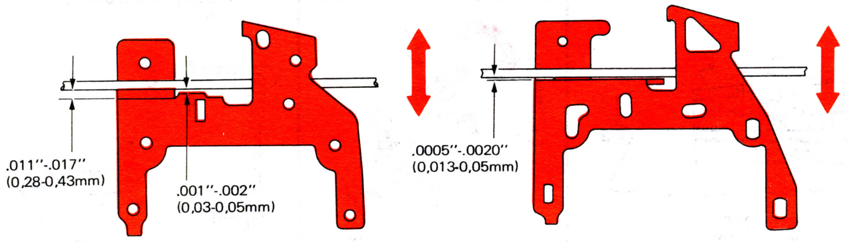
(Level 1)



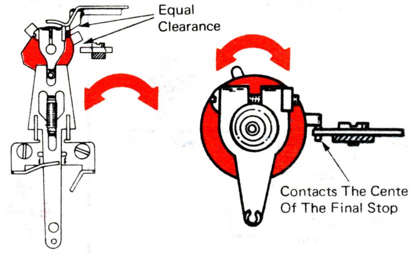
Fails To Fall In Under Hand Operation

(Level 2)

206 Escapement Bracket (06-23)

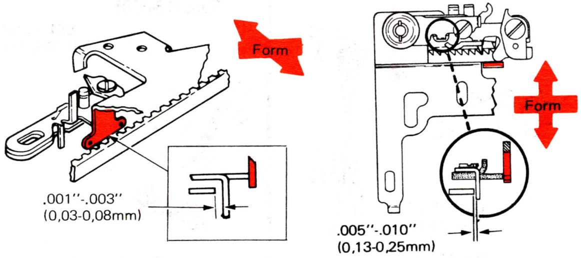


207 Tab Rack Rotational (18-114)

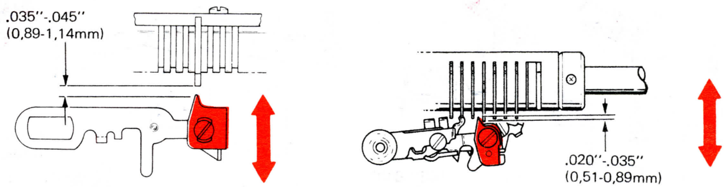


(Level 1) *(Level 2)*

208 Tab Lever Stop (06-23)

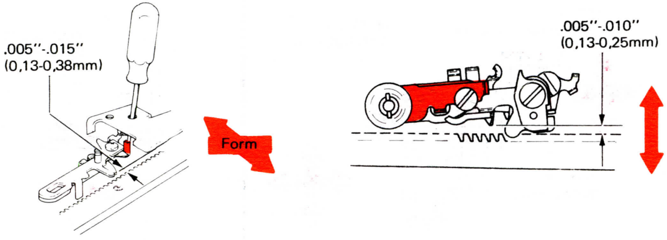


209 Tab Lever Pawl (18-78)



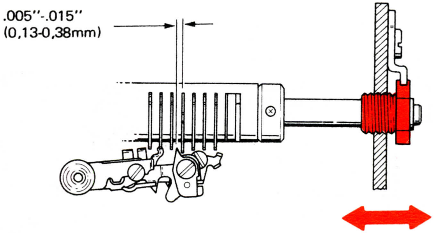
(Level 1) *(Level 1 & 2)*

210 Pawl Clearance (18-47)

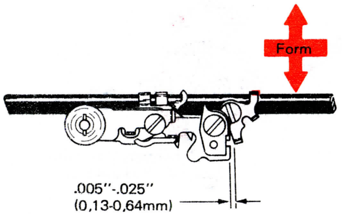


(Level 1 & 2) *(Level 3)*

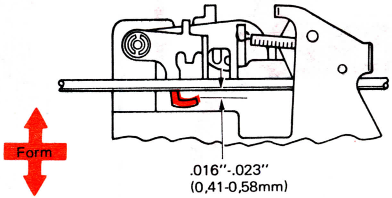
211 Tab Rack Lateral (18-132)



212 Tab Interlock (18-57)

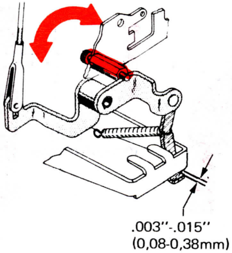


213 Tab Trigger Extension (18-62)

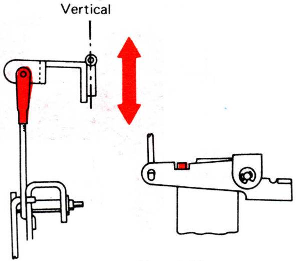


(Level 2)

214 Tab Latch Height (18-228)

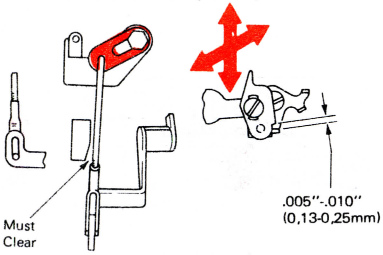


215 Actuating Link (18-241)



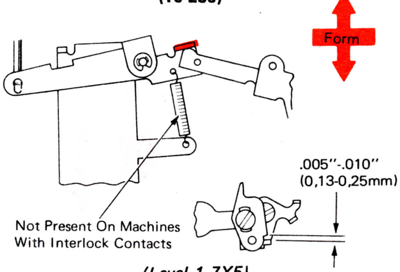
(Level 1)

216 Tab Lever Overthrow (18-225)



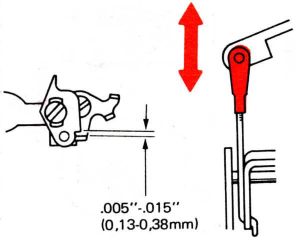
(Level 1)

(18-238)



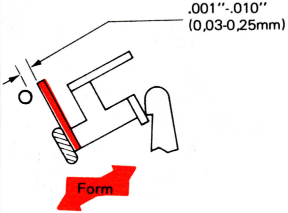
(Level 1 7X5)

(18-240)



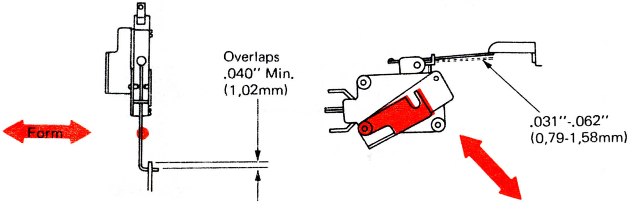
(Level 2 & 3)

217 Tab Torque Bar Overthrow Stop (18-309)



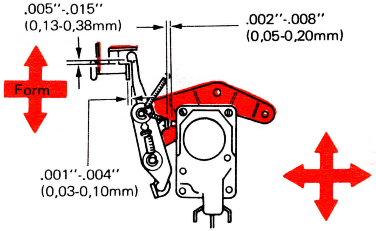
(Level 2 & 3)

218 Interlock Switch (27-150)



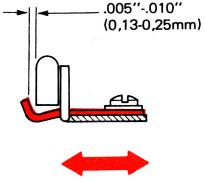
(Level 1)

219 Interlock Switch (18-253)



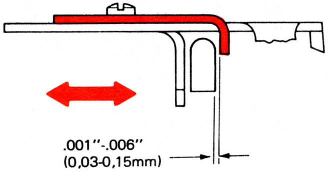
(Level 2 & 3)

220 Tab Lockout Lever (18-46)



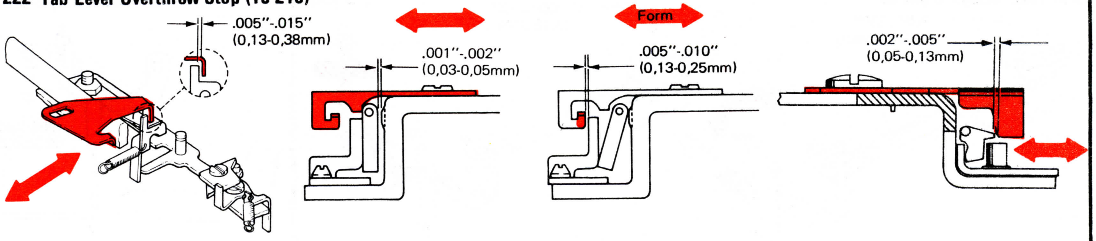
(Level 1)

221 Tab Torque Bar Support (18-218)



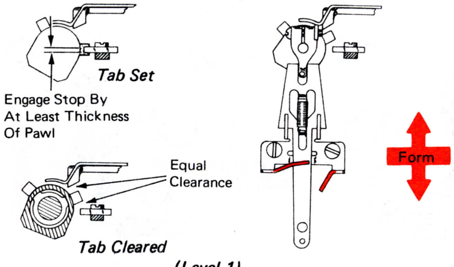
(Level 1)

222 Tab Lever Overthrow Stop (18-218)



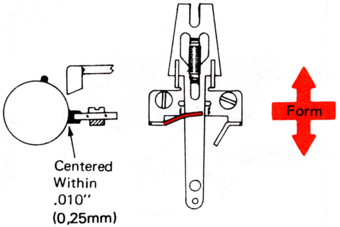
(Level 1) *(Level 2)* *(Level 2)* *(Level 3 – At Rest)*

223 Tab Set And Clear Bracket (18-110)



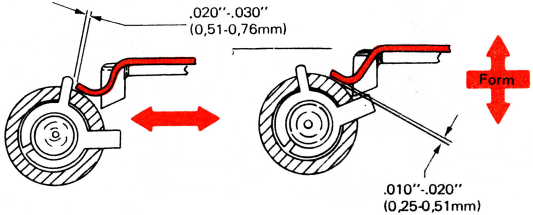
(Level 1)

224 Tab Set Stop Lug (18-110)

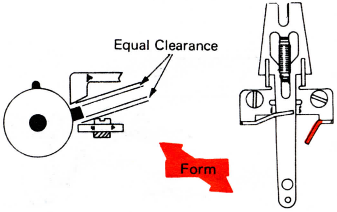


(Level 2)

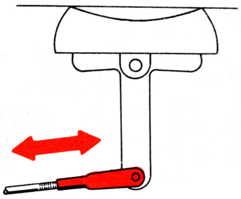
225 Tab Clear Bracket (18-125)



226 Tab Clear Stop Lug (18-110)

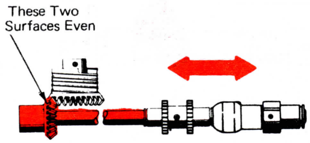


227 Tab Set & Clear Link (18-103)



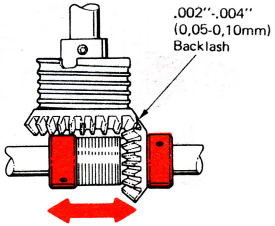
Match Keyboard Slope

228 Gear Mesh (25-44)



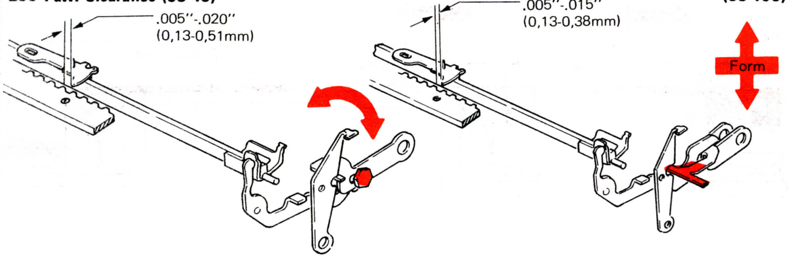
162, 164, 229, 237

229 Tab Pinion Backlash (25-47)



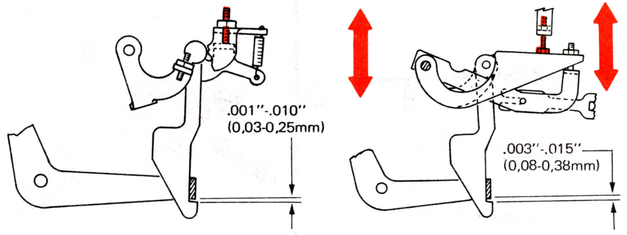
230 Pawl Clearance (03-48)

(03-190)



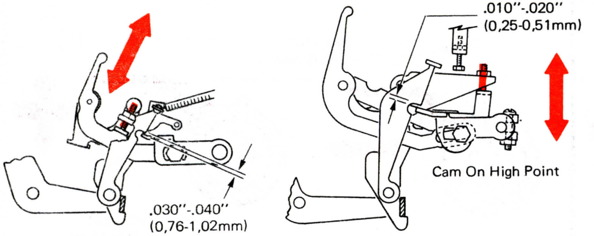
(Level 1) *(Level 2)*

231 Carrier Return Latch Height (03-52)



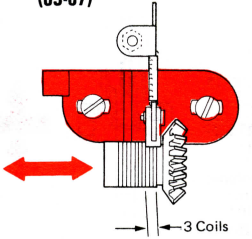
(Level 1) *(Level 2)*

232 Clutch Latch Overthrow (03-195)

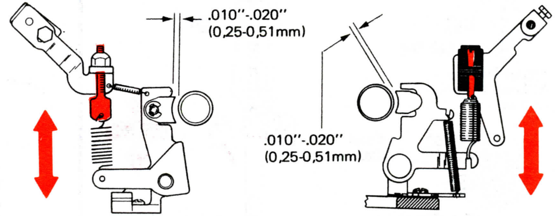


7X1 *7X5 Cam On High Point*

233 Carrier Return Shoe Overlap (03-07)



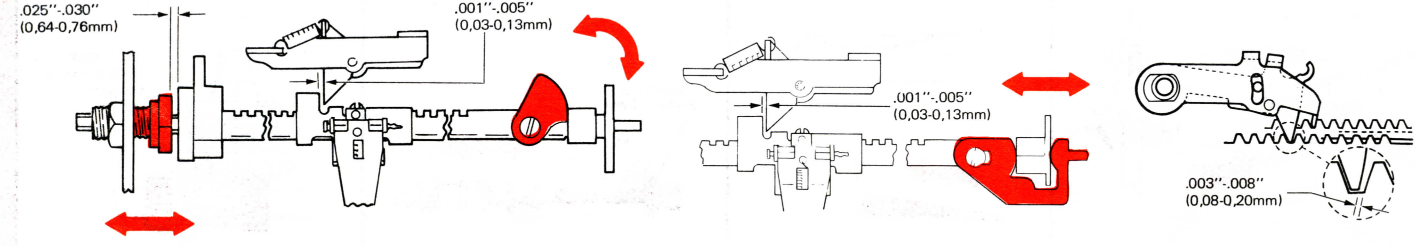
234 Carrier Return Clearance (03-131)



(Level 1) *(Level 2)*

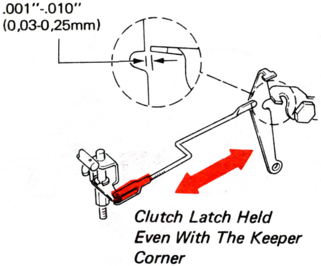
235 Overbank (09-04)

(09-66)

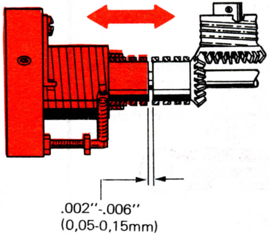


(Level 1) *(Level 2)*

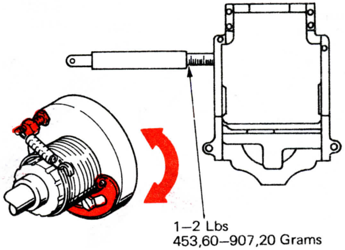
236 Clutch Unlatching (03-63)



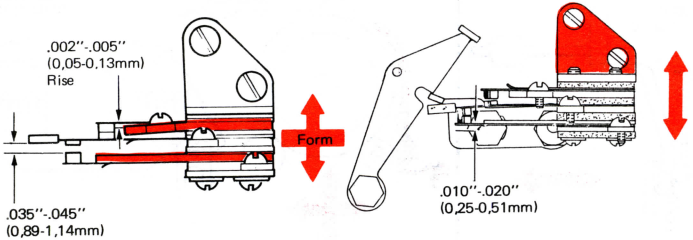
237 Carrier Return Pinion End Play (25-24)



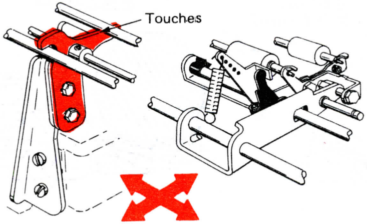
238 Torque Limiter (25-38)



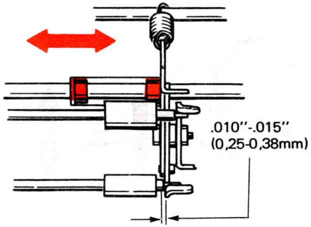
239 Carrier Return Interlock Contacts (27-180)



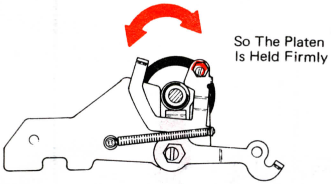
240 Paper Feed Support (22-169)



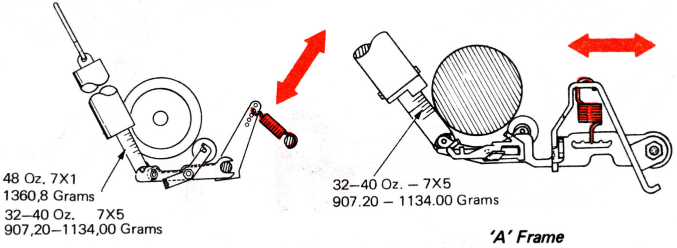
241 Feed Roll End Play (22-155)



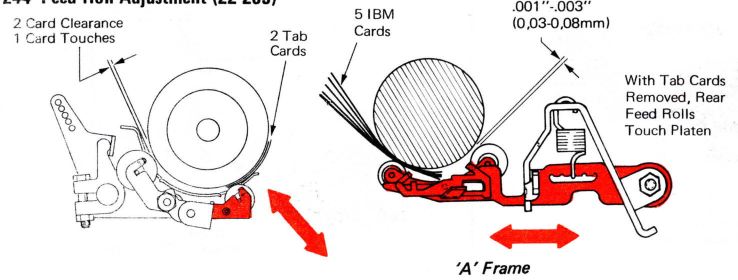
242 Platen Latches (22-10)



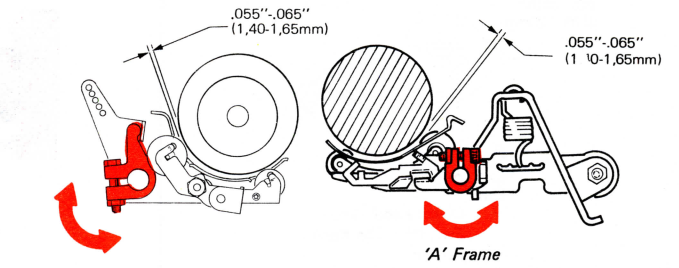
243 Feed Roll Tension (22-59)



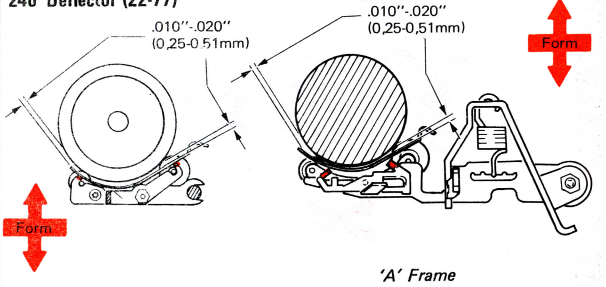
244 Feed Roll Adjustment (22-285)



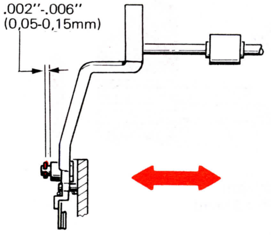
245 Paper Release (22-62) (22-283)



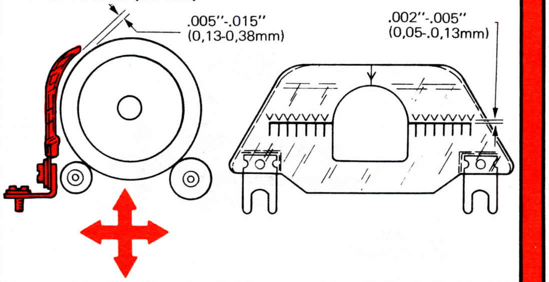
246 Deflector (22-77)



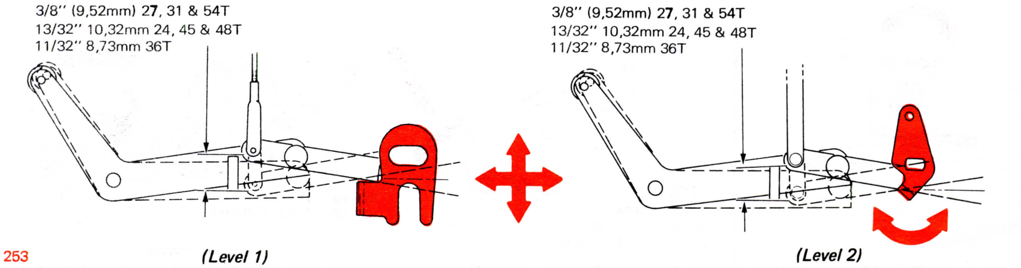
247 Paper Bail (22-32)



248 Cardholder (22-129)

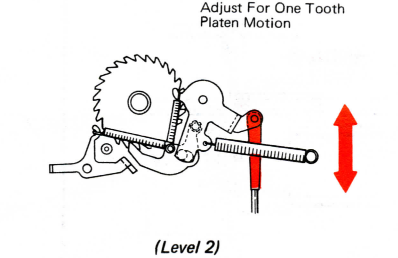


249 Multiplying Lever Stop (20-10)

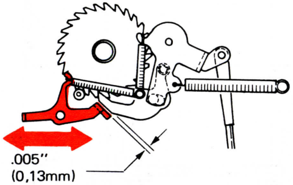

3/8" (9,52mm) 27, 31 & 54T
13/32" 10,32mm 24, 45 & 48T
11/32" 8,73mm 36T
(Level 1)
3/8" (9,52mm) 27, 31 & 54T
13/32" 10,32mm 24, 45 & 48T
11/32" 8,73mm 36T
(Level 2)

253

250 Index Link (20-22)

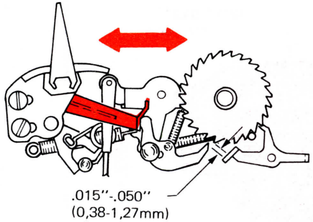


251 Platen Overthrow Stop (20-34)

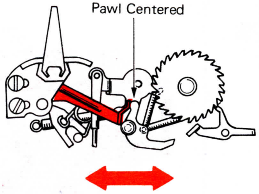


(Level 2 Cam On High Point)

252 Index Selector Cam (20-21)

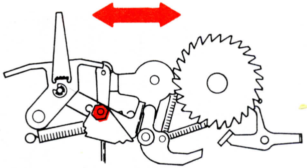


Cam At Rest Double Space Position



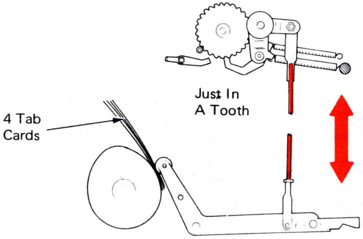
(Level 2 Cam At Rest Single Space Position)

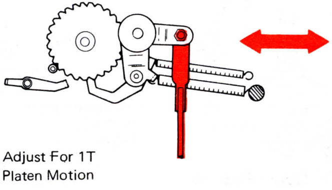
(20-190)



54 Tooth Only

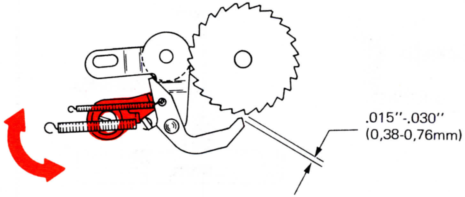
253 Index Link (20-22)





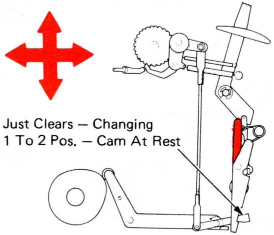
(Level 1)

254 Upper Index Pawl Stop (20-71)



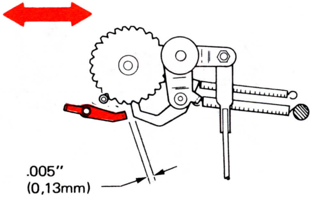
(Level 1)

255 Multiplying Lever Control (20-55)



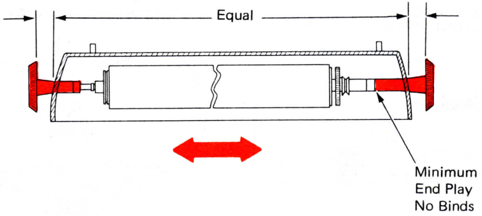
(Level 1)

256 Platen Overthrow Stop (20-60)

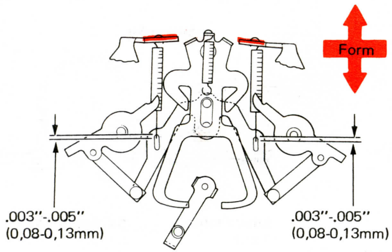


(Level 1)

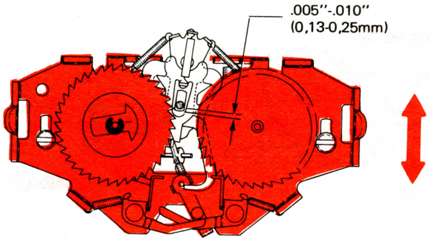
257 Platen Knobs (12-01)



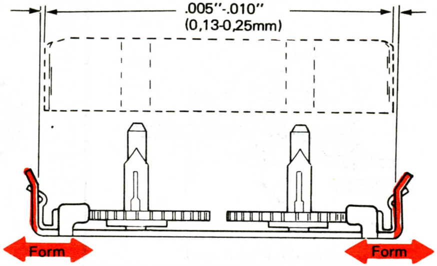
258 Centering Springs (13-28)



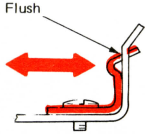
259 Ribbon Feed Plate (13-38)

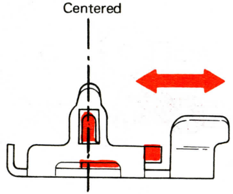


260 Guide Lugs (13-38)

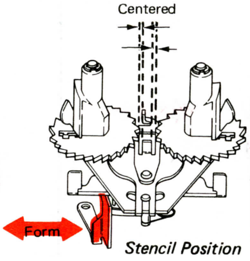


261 Cartridge Retainer Springs (13-77)

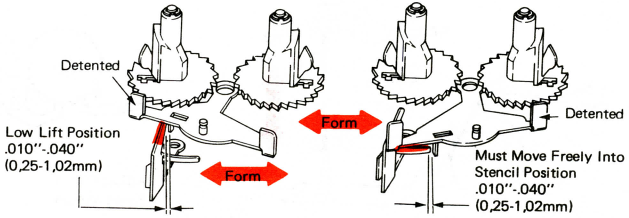




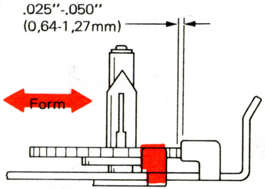
262 Ribbon Lift Lever (13-55)



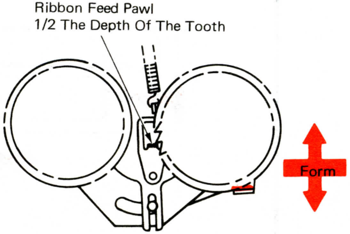
(13-73)



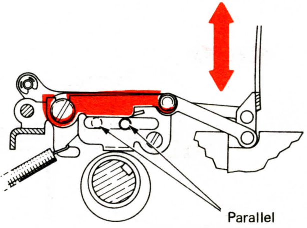
263 Ratchet Detent (13-75)



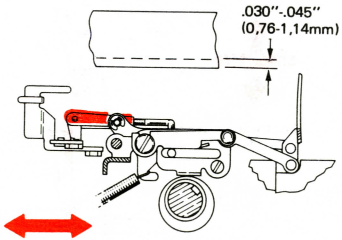
Feed Cam On High Point



264 Ribbon Lift Guide Post (13-37)

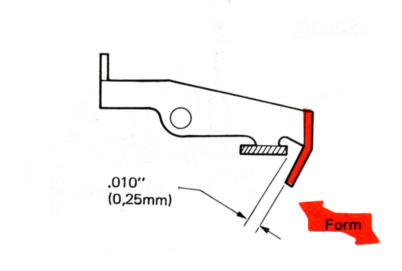


265 Ribbon Lift Control Link (13-63)

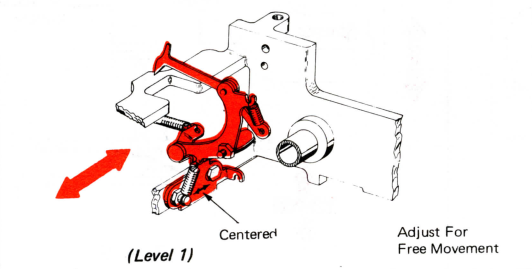


High Lift Position

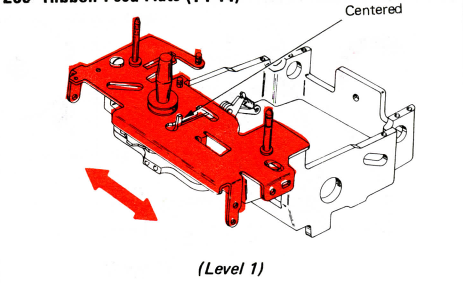
266 Stencil Lockout (13-49)



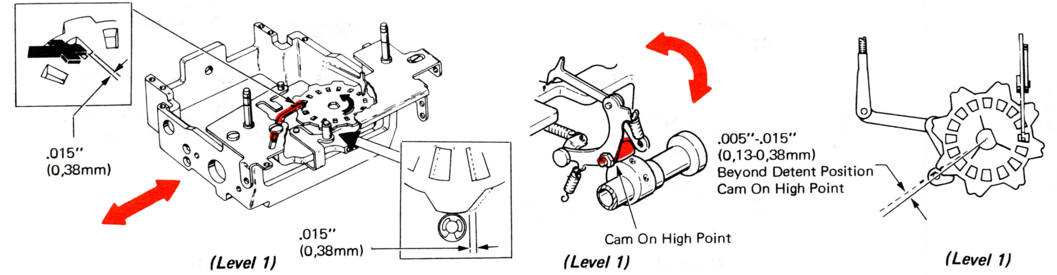
267 Cam Follower Mounting Bracket (14-158)



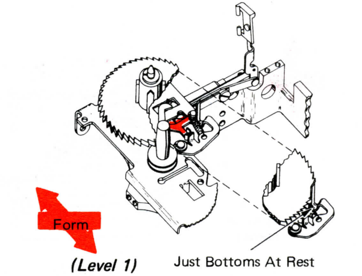
268 Ribbon Feed Plate (14-44)



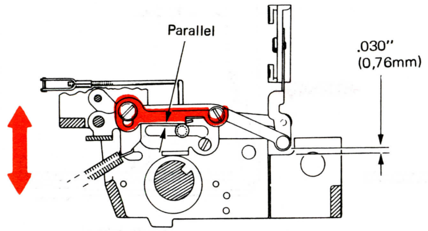
269 Feed & Lift Wheel Detenting (14-48)



270 Brake Actuating Lever (14-30)

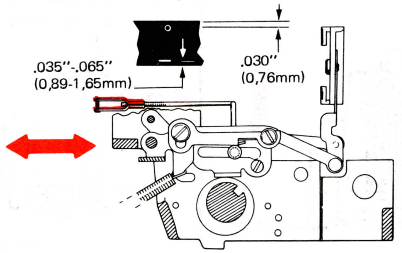


271 Ribbon Lift Guide Plate (14-102)

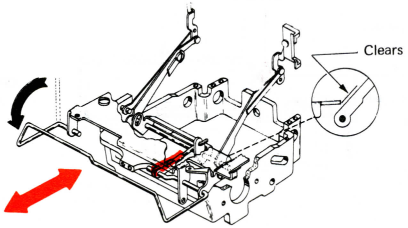


Refer To Ribbon Samples (Page 111)

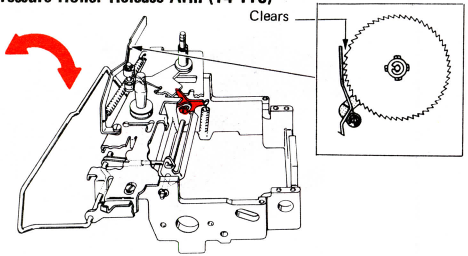
272 Ribbon Lift Link (14-130)



273 Load Lever Link (14-148)

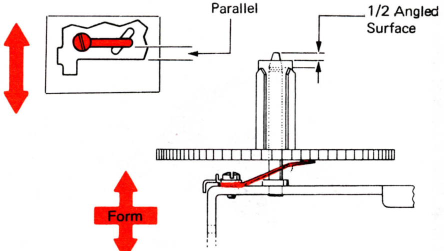


274 Pressure Roller Release Arm (14-116)

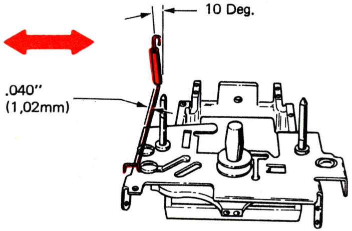


(Level 1)

275 Shock Spring (14-26)

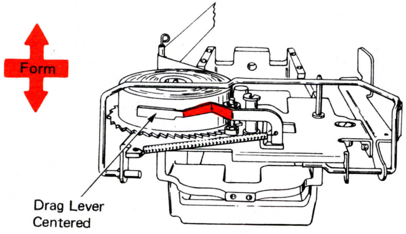


(Level 1)



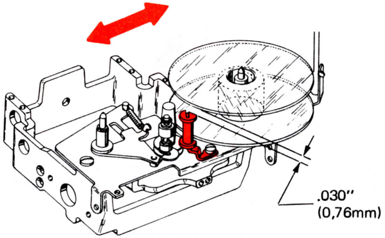
(Level 1)

276 Drag Lever (14-80)

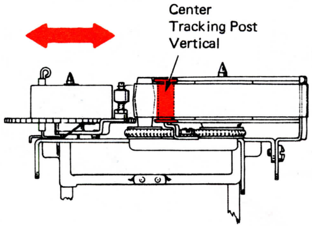


(Level 1)

277 Tracking Post (14-82)

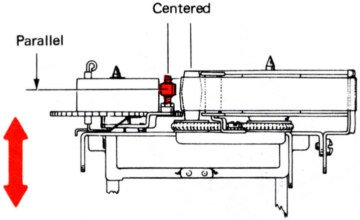


(Level 1)

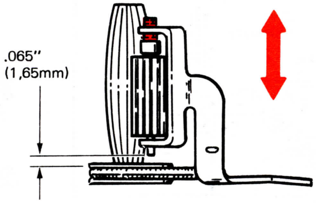


(Level 1)

278 Pressure Roller (14-229)

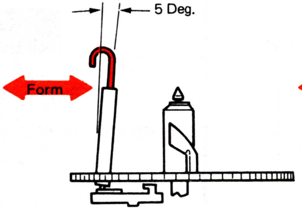


(Level 1)

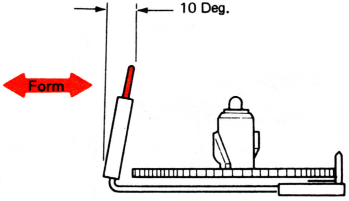


(Level 2)

279 Shock Spring (14-235)



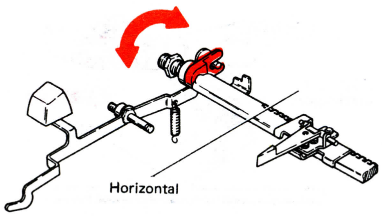
(Front View)



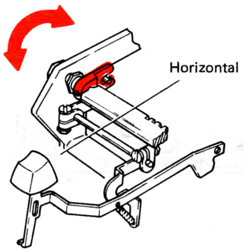
(Side View)

(Level 2)

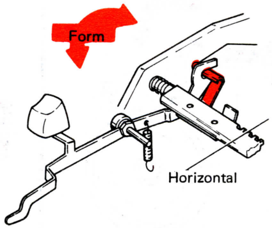
280 Margin Rack Horizontal (09-61)



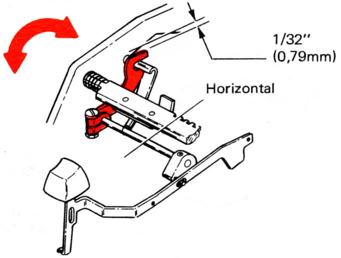
(Level 1 – 11")



(Level 1 – 15")

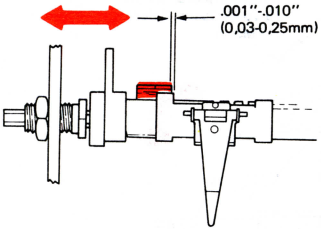


(Level 2 – 11")

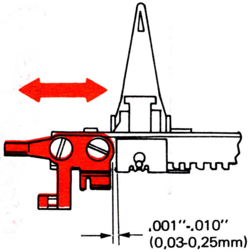


(Level 2 – 15")

281 LH Final Stop (09-61)



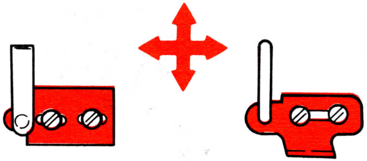
(Level 1)



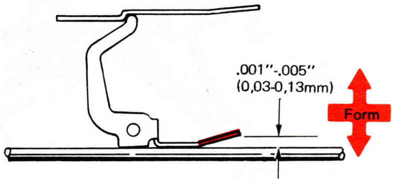
(Level 2)

282 Bellringer Bail Adjusting Plate (09-201)

Parallel Bail To Margin Rack

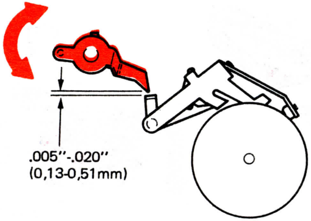


283 Bellringer Bellcrank (09-99)



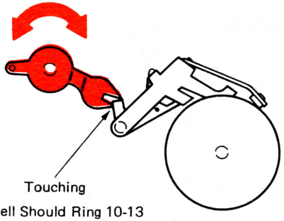
(Level 2 – Carrier In Next To Last Space)

284 Bellringer Bail Lever (09-135)



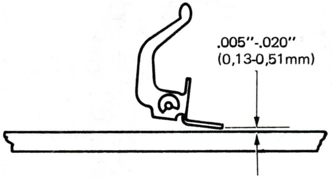
Bell Should Ring 10-13
Spaces Before RH Margin

(Level 2)



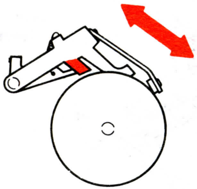
Bell Should Ring 10-13
Spaces Before RH Margin

(Level 2)

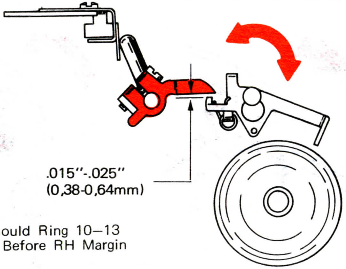


(Level 2)

285 Bellclapper (09-185)



(Level 1 & 2)

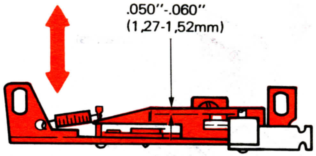


.015"-.025"
(0,38-0,64mm)

Bell Should Ring 10–13
Spaces Before RH Margin

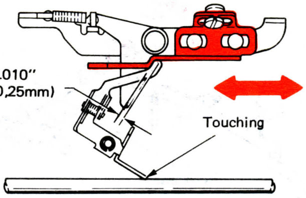
(Level 3)

286 Linelock Bracket (09-18)



.050"-.060"
(1,27-1,52mm)

287 Linelock Bracket Plate (09-96)

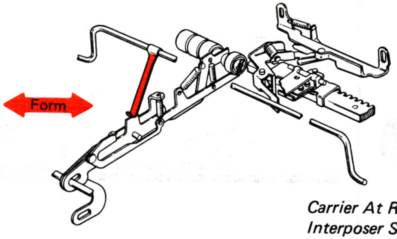


.001"-.010"
(0,03-0,25mm)

Touching

Carrier In
Next To Last Column

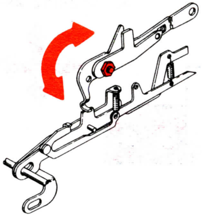
288 Linelock (09-12)



(Level 1)

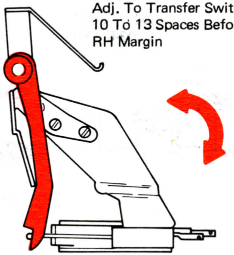
Carrier At RH Margin
Interposer Should
Be Bottomed

(09-277)



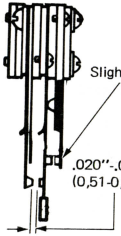
(Level 2)

289 Zone Switch (27-258)



Adj. To Transfer Switch
10 To 13 Spaces Before
RH Margin

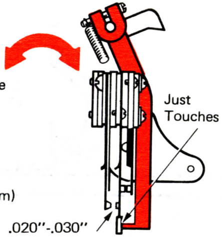
290 Last Column Contacts (27-245)



Slight Rise

.020"-.030"
(0,51-0,76mm)

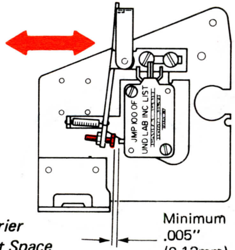
(Level 1)



Just
Touches

.020"-.030"
(0,51-0,76mm)

291 End Of Line Switch (27-215)

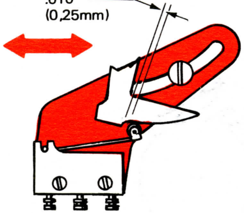


Carrier
Last Space
From Margin

Minimum
.005"
(0,13mm)

(Level 2)

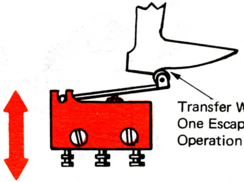
(27-226)



.010"
(0,25mm)

(Level 3)

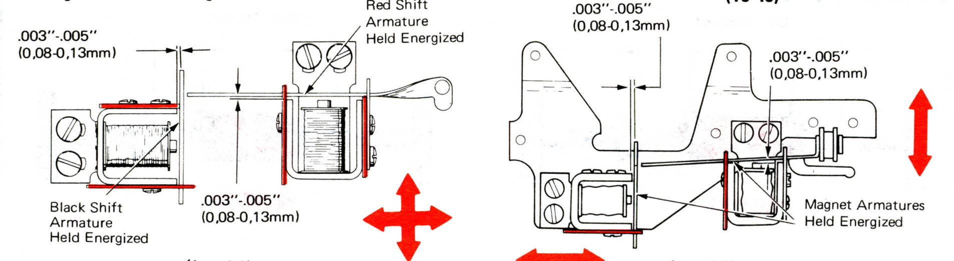
(27-230)



Transfer With
One Escapement
Operation

292 Magnet Armature Hinge Plates (15-49)

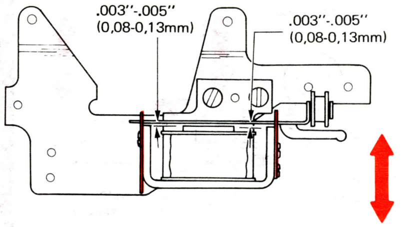
(15-49)



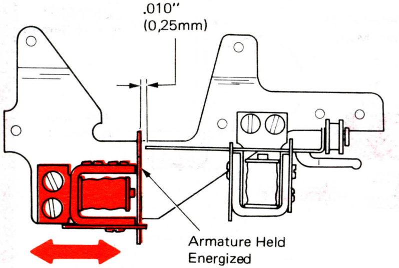
(Level 1)

(Level 2)

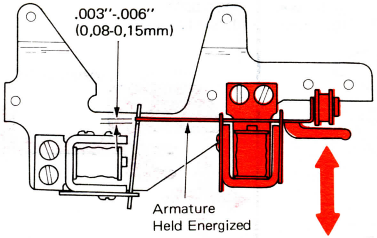
293 Single Magnet Adjustments (15-49)



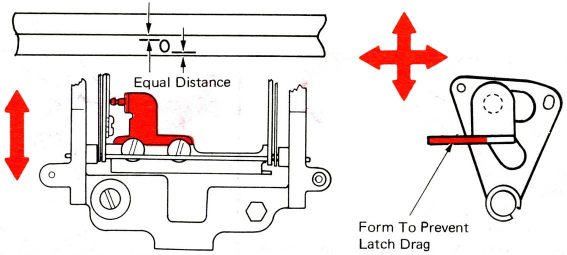
294 Black Magnet Position (15-53)



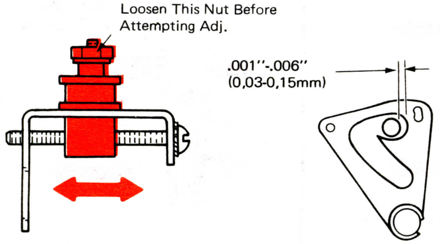
295 Red Magnet Position (15-56)



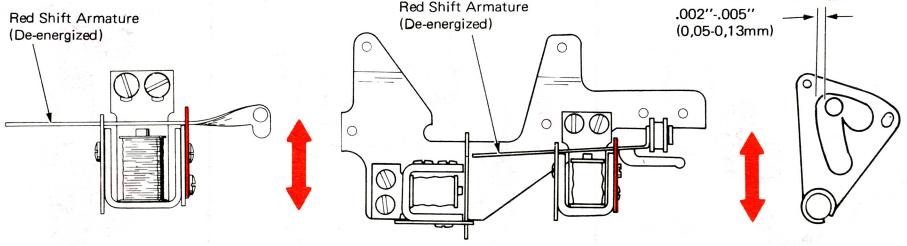
296 Pivot Arm (15-09)



297 RH Tape Pulley (15-20)



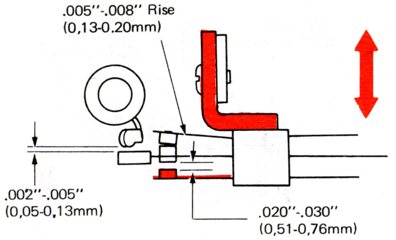
298 Red Ribbon Armature Backstop (15-58)



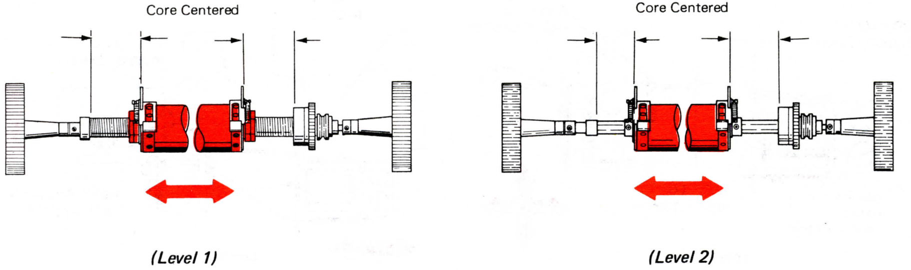
(Level 1)

(Level 2)

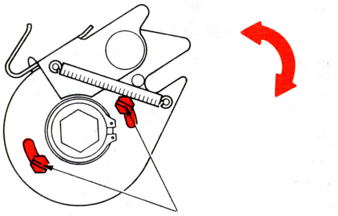
299 Ribbon Mode Contacts (15-33)



300 Platen Core (49-130)

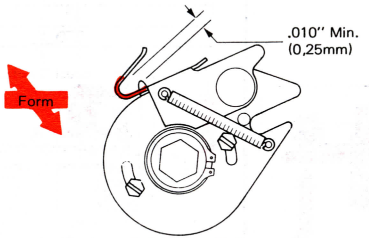


301 Pinwheel Control Plate (49-105)



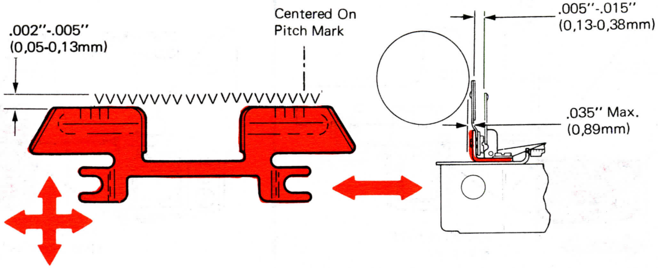
Adjust So The Pins Are Fully Extended Immediately After Passing Into The Slot Of The Form Guide

302 Paper Guides (49-105)

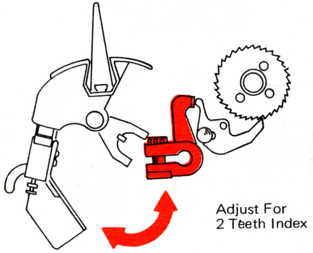


Use Large Bail Rollers. Rollers Should Apply Pressure To Platen.

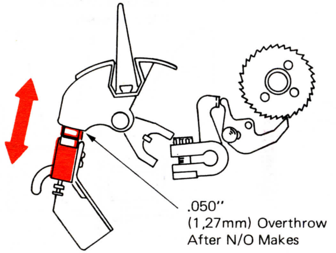
303 Cardholder (49-21)



304 Index Pawl Entry (51-304)

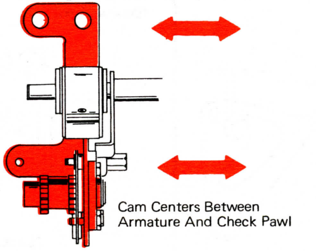


305 Selection Switch (51-309)

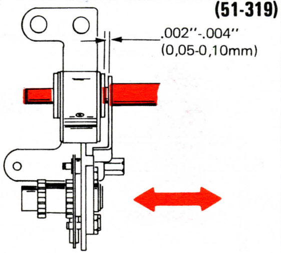


Double Line Mode

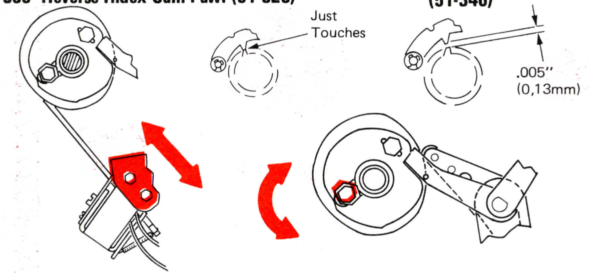
306 Reverse Index Cam And Reverse Index Magnet Mounting Bracket (51-333)



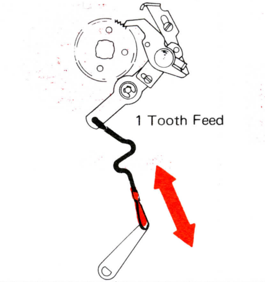
307 Reverse Index Cam Follower Shaft (51-319)



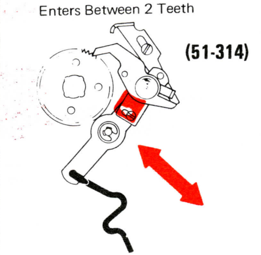
308 Reverse Index Cam Pawl (51-323)



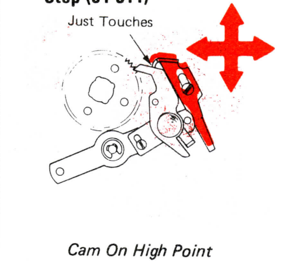
309 Reverse Index Link (51-310)



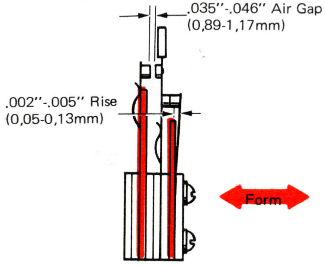
310 Reverse Index Pawl Guide



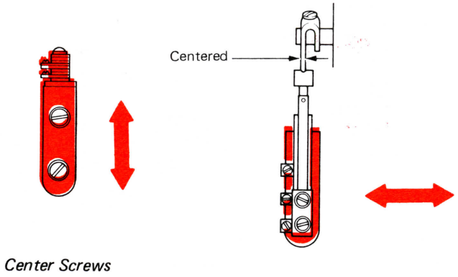
311 Reverse Index Pawl Overthrow Stop (51-311)



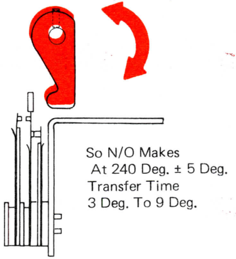
312 C8 Contact Supports (51-335)



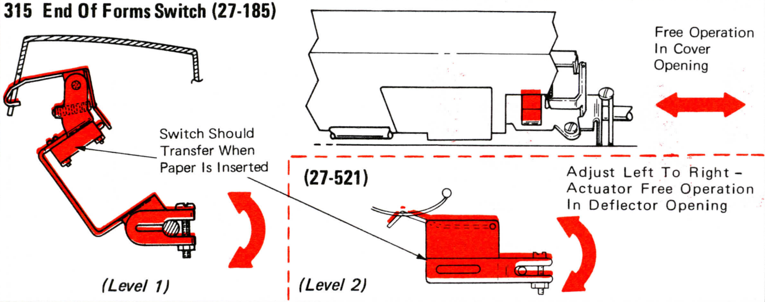
313 C8 Contact Mounting Bracket (51-335)



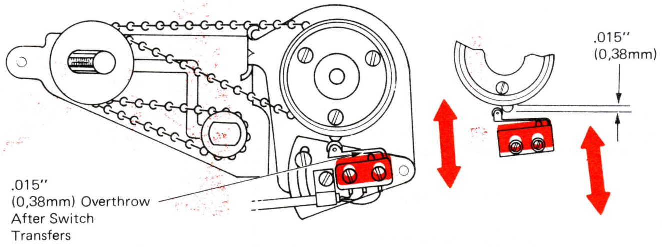
314 C8 Contact Actuator (51-341)



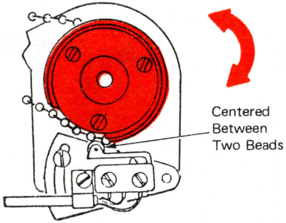
315 End Of Forms Switch (27-185)

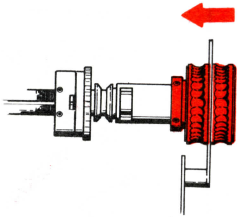


316 Bead Chain Switches (50-203)

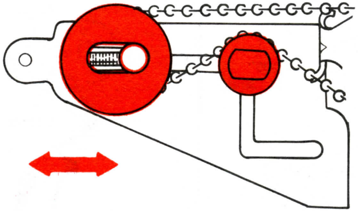


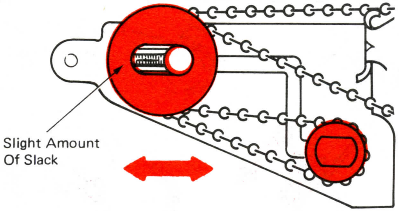
317 Chain Position (50-216)





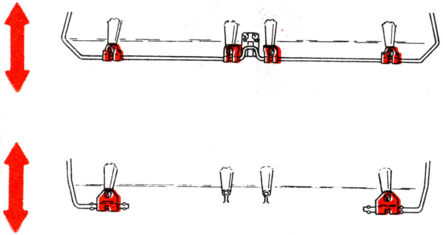
318 Idler Adjustment (50-218)



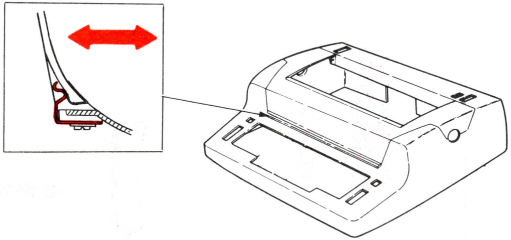


CAUTION: Adjust for moderate tension. Chains which are tight could cause malfunctions in the index mechanism.

319 Top Cover Hinge (04-149)

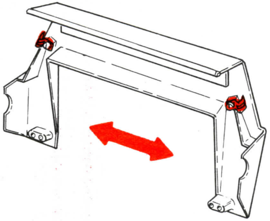


So Contour Matches Center Cover



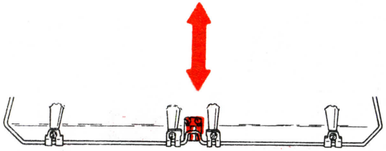
(Level 1)

Latches Securely



(Level 2)

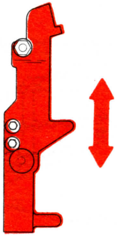
320 Hinge Spring (04-143)



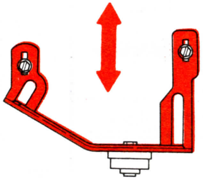
Cover Detented

So Cover Is Held Open

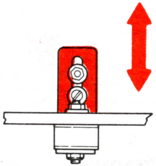
321 Printer Position (04-127)



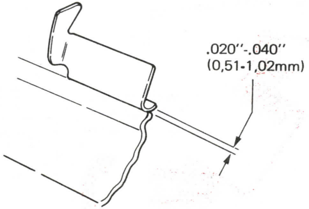
(04-138)



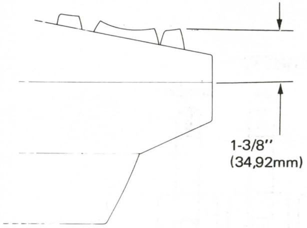
(04-14)

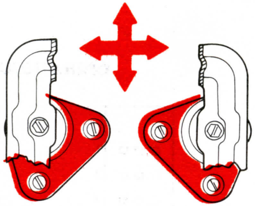


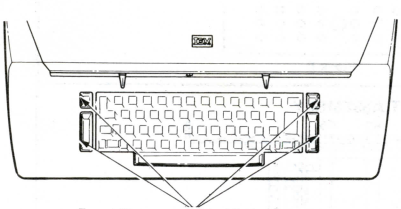
Ring Mount Covers



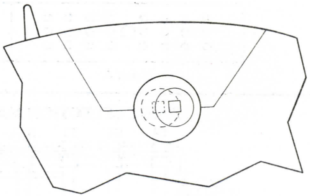
322 Printer Position (Cont'd.) (04-122)



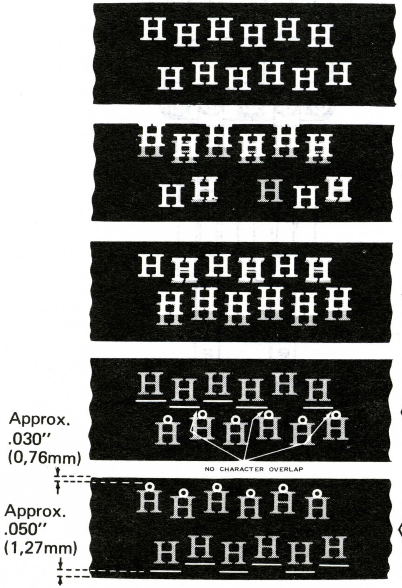




Equal Clearance With All Keybuttons



Film Ribbon Samples (See Frame 271)



A LIFT GUIDE PLATE PARALLEL TO SLOT IN CAM FOLLOWER

B LIFT GUIDE PLATE OUT OF PARALLEL TOO HIGH AT THE REAR

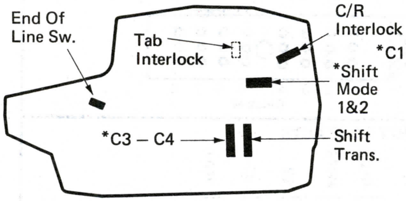
C LIFT GUIDE PLATE OUT OF PARALLEL TOO HIGH AT THE FRONT

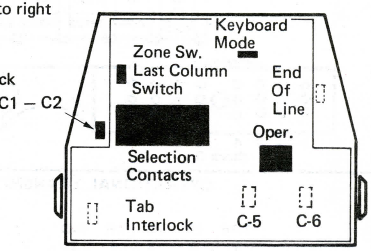
D LIFT GUIDE PLATE PARALLEL TO SLOT IN CAM FOLLOWER

E LIFT GUIDE PLATE PARALLEL TO SLOT IN CAM FOLLOWER

I/O CONTACT LOCATIONS

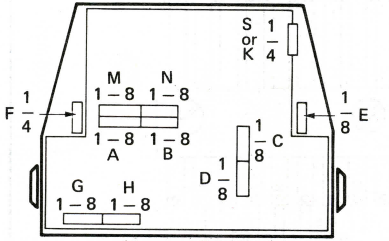
***NOTE:** Contact groups are numbered from left to right when looking from the front.





(Bottom View)

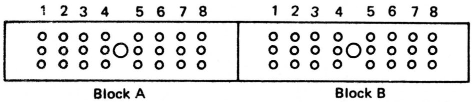
I/O TERMINAL BLOCK LOCATIONS



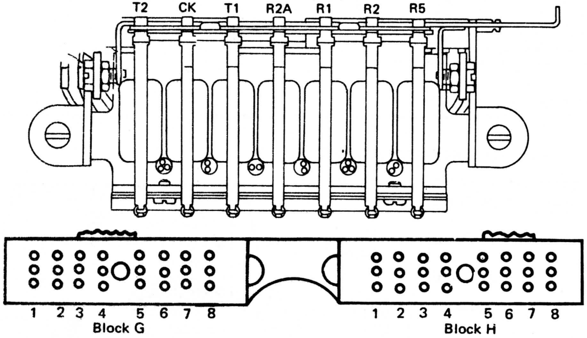
(Bottom View)

NOTE: No "Selectric" I/O Printer has all illustrated terminal blocks. The terminal blocks present appear in this configuration and are designated by indicated lettering.

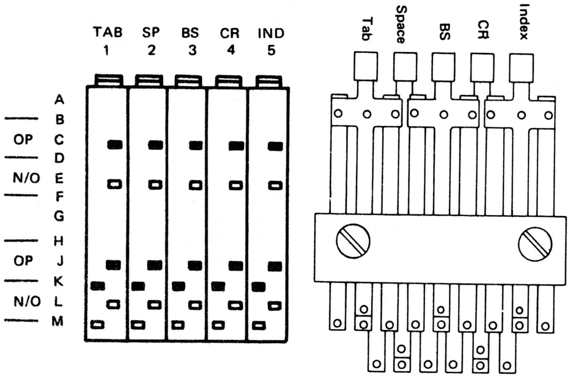
SELECTION CONTACT TERMINAL BLOCKS



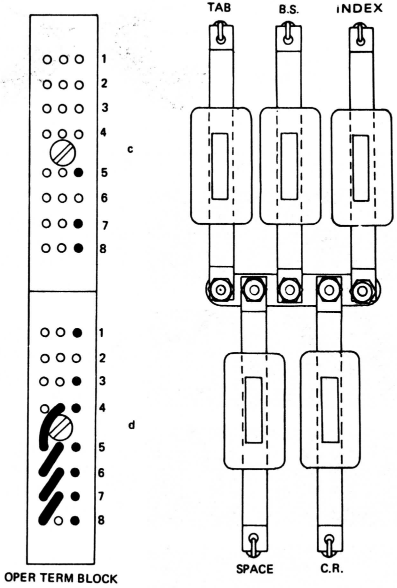
PRINT SELECTION MAGNET ASSEMBLY



OPERATIONAL TRANSMIT CONTACTS



OPERATIONAL MAGNETS



BCD MACHINE							
	OPERATIONAL BIT CODE						
OPERATION	1	2	4	8	A	B	C K
Space	1	0	1	1	0	0	0
Backspace	0	1	1	1	0	1	1
Tab	1	0	1	1	1	0	1
CR	1	0	1	1	0	1	1
Index	1	0	1	1	1	1	0
UC SH.	0	1	1	1	0	0	0
LC SH.	0	1	1	1	1	1	0

NOTES:

1. Both a 4 and an 8 bit are transmitted during each operational function. Closing any N/O operational feedback contact (C3, C4, C5, or C6) connects terminal X (see BCD wiring diagram) to lines 4 and 8.

2. All other bits for operational functions are generated by closure of the operational transmitting contacts and are gated by either C3, C4, C5, or C6.

BCD MACHINE				
CONTACTS INVOLVED IN GENERATION OF ALPHA-NUMERIC BITS				
BIT	TERM. IN	THROUGH DIODES, PRINT SELECTION TRANSMITTING AND SHIFT MODE CONTACTS	TERM. OUT	CASE
1	1	R5 N/C & R2A* N/O R5 N/O & R2A N/C & No. 2 N/C	y y	U or L L
2	2	R1 N/O D & R2* N/C & D No. 2 N/O	y y	U or L U
4	4	No. 1 N/O & D & R2A* N/O No. 1 N/C & R2 N/O & R2A* N/C D & R1* N/C & D & No. 2 N/O	y y y	U L U
8	8	D & No. 2 N/O D & R2A N/O & No. 2 N/C	y y	U L
A	A	T1 N/O	y	U or L
B	B	T2 N/O	y	U or L
CK	CK	D & CK* N/O & No. 2 N/C D & CK N/C & D & No. 2 N/O	y y	L U

NOTES:

1. Asterisked (*) rotate contacts are bottom right — all others are bottom left.

2. Circuits through N/O tilt, rotate, and no. 1 and no. 2 mode contacts indicate the the contact is transferred.

3. Circuits through N/C tilt, rotate, and no. 1 and no. 2 mode contacts indicate that the contact is not transferred.

BCD INPUT CODES

Input Mode (E.T. to line) Code Transmitted

CHARACTER	CASE	*BIT LINES PULSED						
		1	2	4	8	A	B	CK
■	U	0	0	0	0	0	0	0
A	L	1	0	0	0	1	1	0
■	U	0	0	0	0	0	0	0
B	L	0	1	0	0	1	1	0
■	U	0	0	0	0	0	0	0
C	L	1	1	0	0	1	1	1
■	U	0	0	0	0	0	0	0
D	L	0	0	1	0	1	1	0
■	U	0	0	0	0	0	0	0
E	L	1	0	1	0	1	1	1
■	U	0	0	0	0	0	0	0
F	L	0	1	1	0	1	1	1
?	U	0	1	0	1	1	1	1
G	L	1	1	1	0	1	1	0
⌑	U	0	0	1	1	1	1	1
H	L	0	0	0	1	1	1	0
[	U	1	0	1	1	1	1	0
I	L	1	0	0	1	1	1	1
■	U	0	0	0	0	0	0	0
J	L	1	0	0	0	0	1	1
■	U	0	0	0	0	0	0	0
K	L	0	1	0	0	0	1	1
■	U	0	0	0	0	0	0	0
L	L	1	1	0	0	0	1	0
■	U	0	0	0	0	0	0	0
M	L	0	0	1	0	0	1	1
■	U	0	0	0	0	0	0	0
N	L	1	0	1	0	0	1	0
■	U	0	0	0	0	0	0	0
O	L	0	1	1	0	0	1	0
!	U	0	1	0	1	0	1	0
P	L	1	1	1	0	0	1	1
*	U	0	0	1	1	0	1	0
Q	L	0	0	0	1	0	1	1
]	U	1	0	1	1	0	1	1
R	L	1	0	0	1	0	1	0
■	U	0	0	0	0	0	0	0
S	L	0	1	0	0	1	0	1
■	U	0	0	0	0	0	0	0
T	L	1	1	0	0	1	0	0
■	U	0	0	0	0	0	0	0
U	L	0	0	1	0	1	0	1
■	U	0	0	0	0	0	0	0
V	L	1	0	1	0	1	0	0
■	U	0	0	0	0	0	0	0
W	L	0	1	1	0	1	0	0
‡	U	0	1	0	1	1	0	0
X	L	1	1	1	0	1	0	1
%	U	0	0	1	1	1	0	0
Y	L	0	0	0	1	1	0	1
~	U	1	0	1	1	1	0	1
Z	L	1	0	0	1	1	0	0
■	U	0	0	0	0	0	0	0
1	L	1	0	0	0	0	0	0
■	U	0	0	0	0	0	0	0
2	L	0	1	0	0	0	0	0
■	U	0	0	0	0	0	0	0
3	L	1	1	0	0	0	0	1
■	U	0	0	0	0	0	0	0
4	L	0	0	1	0	0	0	0
■	U	0	0	0	0	0	0	0
5	L	1	0	1	0	0	0	1
■	U	0	0	0	0	0	0	0
6	L	0	1	1	0	0	0	1
■	U	0	0	0	0	0	0	0
7	L	1	1	1	0	0	0	0
@	U	0	0	1	1	0	0	1
8	L	0	0	0	1	0	0	0
:	U	1	0	1	1	0	0	0
9	L	1	0	0	1	0	0	1
>	U	0	1	1	1	0	0	0
Ø	L	0	1	0	1	0	0	1
;	U	0	1	1	1	0	1	1
	L	0	0	0	0	0	1	0
√	U	1	1	1	1	0	0	1
#	L	1	1	0	1	0	0	0
\	U	0	1	1	1	1	0	1
ƀ	L	0	0	0	0	1	0	0
<	U	0	1	1	1	1	1	0
&	L	0	0	0	0	1	1	1
△	U	1	1	1	1	0	1	0
$	L	1	1	0	1	0	1	1
⧻	U	1	1	1	1	1	0	0
,	L	1	1	0	1	1	0	1
ǂ	U	1	1	1	1	1	1	1
.	L	1	1	0	1	1	1	0
■	U	0	0	0	0	0	0	0
/	L	1	0	0	0	1	0	1

BCD OUTPUT CODES

Output Mode (Line to E.T.) Code Received

CHARACTER	CASE	MAGNETS PULSED						
		R1	R2	R2A	R-5	T1	T2	CK
■	U	0	0	0	0	0	0	0
A	L	1	1	1	1	0	0	1
■	U	0	0	0	0	0	0	0
B	L	0	1	1	0	0	0	1
■	U	0	0	0	0	0	0	0
C	L	0	1	1	1	0	0	0
■	U	0	0	0	0	0	0	0
D	L	1	0	1	0	0	0	1
■	U	0	0	0	0	0	0	0
E	L	1	0	1	1	0	0	0
■	U	0	0	0	0	0	0	0
F	L	0	0	1	0	0	0	0
?	U	0	0	1	1	0	0	1
G	L	0	0	1	1	0	0	1
⌑	U	1	0	0	1	0	0	1
H	L	1	0	0	1	0	0	1
[	U	1	0	0	0	0	0	0
I	L	1	0	0	0	0	0	0
■	U	0	0	0	0	0	0	0
J	L	1	1	1	1	1	0	0
■	U	0	0	0	0	0	0	0
K	L	0	1	1	0	1	0	0
■	U	0	0	0	0	0	0	0
L	L	0	1	1	1	1	0	1
■	U	0	0	0	0	0	0	0
M	L	1	0	1	0	1	0	0
■	U	0	0	0	0	0	0	0
N	L	1	0	1	1	1	0	1
■	U	0	0	0	0	0	0	0
O	L	0	0	1	0	1	0	1
!	U	0	0	1	1	1	0	0
P	L	0	0	1	1	1	0	0
*	U	1	0	0	1	1	0	0
Q	L	1	0	0	1	1	0	0
]	U	1	0	0	0	1	0	1
R	L	1	0	0	0	1	0	1
■	U	0	0	0	0	0	0	0
S	L	0	1	1	0	0	1	0
■	U	0	0	0	0	0	0	0
T	L	0	1	1	1	0	1	1
■	U	0	0	0	0	0	0	0
U	L	1	0	1	0	0	1	0
■	U	0	0	0	0	0	0	0
V	L	1	0	1	1	0	1	1
■	U	0	0	0	0	0	0	0
W	L	0	0	1	0	0	1	1
‡	U	0	0	1	1	0	1	0
X	L	0	0	1	1	0	1	0
%	U	1	0	0	1	0	1	0
Y	L	1	0	0	1	0	1	0
~	U	1	0	0	0	0	1	1
Z	L	1	0	0	0	0	1	1
■	U	0	0	0	0	0	0	0
1	L	1	1	1	1	1	1	1
■	U	0	0	0	0	0	0	0
2	L	0	1	1	0	1	1	1
■	U	0	0	0	0	0	0	0
3	L	0	1	1	1	1	1	0
■	U	0	0	0	0	0	0	0
4	L	1	0	1	0	1	1	1
■	U	0	0	0	0	0	0	0
5	L	1	0	1	1	1	1	0
■	U	0	0	0	0	0	0	0
6	L	0	0	1	0	1	1	0
■	U	0	0	0	0	0	0	0
7	L	0	0	1	1	1	1	1
@	U	1	0	0	1	1	1	1
8	L	1	0	0	1	1	1	1
:	U	1	0	0	0	1	1	0
9	L	1	0	0	0	1	1	0
>	U	0	0	0	1	1	1	0
Ø	L	0	0	0	1	1	1	0
;	U	1	1	1	0	1	0	1
-	L	1	1	1	0	1	0	1
√	U	0	0	0	0	1	1	1
#	L	0	0	0	0	1	1	1
\	U	1	1	1	0	0	1	1
ƀ	L	1	1	1	0	0	1	1
<	U	1	1	1	0	0	0	0
&	L	1	1	1	0	0	0	0
△	U	0	0	0	0	1	0	0
$	L	0	0	0	0	1	0	0
⧻	U	0	0	0	0	0	1	0
,	L	0	0	0	0	0	1	0
ǂ	U	0	0	0	0	0	0	1
.	L	0	0	0	0	0	0	1
■	U	0	0	0	0	0	0	0
/	L	1	1	1	1	0	1	0

NOTES:

■ Selecting upper case type element positions where a black square (pillow) appears will generate an invalid code, and will cause a pillow to be printed. The parity check may appear either odd or even.

* Bits are formed by contact closure (print selection transmitting and shift mode) between terminal "Y" and the bit lines (see BCD Wiring Diagram, page 116).

SELECTION AND TILT-ROTATE SCHEDULE

BCD KEYBOARD												CORRESPONDENCE KEYBOARD										
UC	LC	T2	CK	T1	R2A	R1	R2	R5	TLT	ROT		UC	LC	T2	CK	T1	R2A	R1	R2	R5	TLT	ROT
■	A	X		X				X	3	-5		A	a	X	X			X	X	X	2	-2
■	B	X		X		X			3	+1		B	b		X	X	X	X	X		1	+5
■	C	X	X	X		X		X	3	-4		C	c		X	X		X	X	X	1	-2
■	D	X		X			X		3	+2		D	d			X			X	X	1	-3
■	E	X	X	X			X	X	3	-3		E	e		X	X			X		1	+2
■	F	X	X	X		X	X		3	+3		F	f	X	X	X		X		X	3	-4
?	G	X		X		X	X	X	3	-2		G	g	X		X				X	3	-5
⌑	H	X		X	X		X	X	3	-1		H	h			X	X		X		1	+4
[	I	X	X	X	X		X		3	+4		I	i	X				X	X		2	+3
■	J	X	X					X	2	-5		J	j	X	X	X					3	0
■	K	X	X			X			2	+1		K	k			X		X	X		1	+3
■	L	X				X		X	2	-4		L	l		X	X	X		X	X	1	-1
■	M	X	X				X		2	+2		M	m	X	X					X	2	-5
■	N	X					X	X	2	-3		N	n		X	X		X			1	+1
■	O	X				X	X		2	+3		O	o	X	X		X		X	X	2	-1
!	P	X	X			X	X	X	2	-2		P	p	X		X			X		3	+2
⁕	Q	X	X		X		X	X	2	-1		Q	q	X	X	X		X	X		3	+3
]	R	X			X		X		2	+4		R	r	X					X	X	2	-3
■	S		X	X		X			1	+1		S	s	X			X		X		2	+4
■	T			X		X		X	1	-4		T	t			X					1	0
■	U		X	X			X		1	+2		U	u			X		X		X	1	-4
■	V			X			X	X	1	-3		V	v	X				X		X	2	-4
■	W			X		X	X		1	+3		W	w	X	X		X	X	X		2	+5
‡	X		X	X		X	X	X	1	-2		X	x		X	X				X	1	-5
%	Y		X	X	X		X	X	1	-1		Y	y	X	X	X	X		X		3	+4
⌢	Z			X	X		X		1	+4		Z	z		X						0	0
■	1							X	0	-5		[	]							X	0	-5
■	2					X			0	+1		@	2					X			0	+1
■	3		X			X		X	0	-4		#	3		X			X		X	0	-4
■	4						X		0	+2		$	4				X		X	X	0	-1
■	5		X				X	X	0	-3		%	5						X		0	+2
■	6		X			X	X		0	+3		¢	6		X			X	X		0	+3
■	7					X	X	X	0	-2		&	7		X				X	X	0	-3
@	8				X		X	X	0	-1		*	8					X	X	X	0	-2
:	9		X		X		X		0	+4		(	9				X	X	X		0	+5
>	0		X		X	X	X	X	0	0		)	0		X		X		X		0	+4
;	-	X							2	0		_	-	X		X	X	X	X		3	+5
√	#				X	X	X		0	+5		+	=	X		X		X			3	+1
\	ƀ			X					1	0		°	!	X							2	0
<	Ɛ	X	X	X					3	0		:	;	X	X	X			X	X	3	-3
△	$	X	X		X	X	X		2	+5		"	'	X	X				X		2	+2
⧻	,		X	X	X	X	X		1	+5		,	,	X		X		X	X	X	3	-2
ǂ	.	X		X	X	X	X		3	+5		.	.	X	X			X			2	+1
■	/		X	X				X	1	-5		?	/	X		X	X		X	X	3	-1

X in Square* — Indicates; 1. Selection Contact Transferred
2. Latches Active

Blank Square* — Indicates Selection Magnet Energized

*Exception — X in R5 Column Indicates Both Selection Contact Transferred and Magnet Energized.

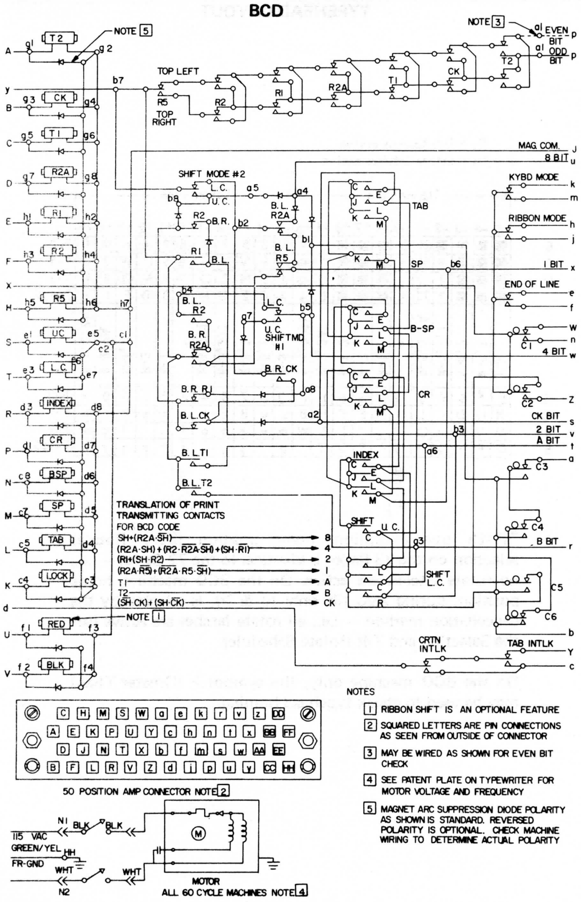
TYPEHEAD LAYOUT

T - #'s = Tilt latches active
R - #'s = Rotate latches active

	Upper Case											Lower Case											
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
B	■	■	■	■	@	>	■	■	■	:	√	1	3	5	7	8	0	2	4	6	9	#	T-0
C	■	■	■	‡	%	\	■	■	■	⌢	⧻	/	T	V	X	Y	ƀ	Ş	U	W	Z	,	T-1
D	■	■	■	!	⁕	;	■	■	■	]	△	J	L	N	P	Q	-	K	M	O	R	$	T-2
	■	■	■	?	⌑	<	■	■	■	[	ǂ	A	C	E	G	H	Ɛ	B	D	F	I	·	T-1,2
	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	*	R-1	R-2	R-T,2	R-2,2A	R-1,2,2A	R-5	R-5,1	R-5,2	R-5,2,1	R-5,2,2A	*	R-1	R-2	R-1,2	R-2,2A	R-1,2,2A	
C	[	#	&	⁕	$	Z	@	%	¢	)	(	]	3	7	8	4	z	2	5	6	0	9	T-0
O	X	U	D	C	L	T	N	E	K	H	B	x	u	d	c	l	t	n	e	k	h	b	T-1
R	M	V	R	A	O	°	.	"	I	S	W	m	v	r	a	o	!	.	'	i	s	w	T-2
R	G	F	:	,	?	J	+	P	Q	Y	_	g	f	;	,	/	j	=	p	q	y	-	T-1,2
						HOME											HOME						

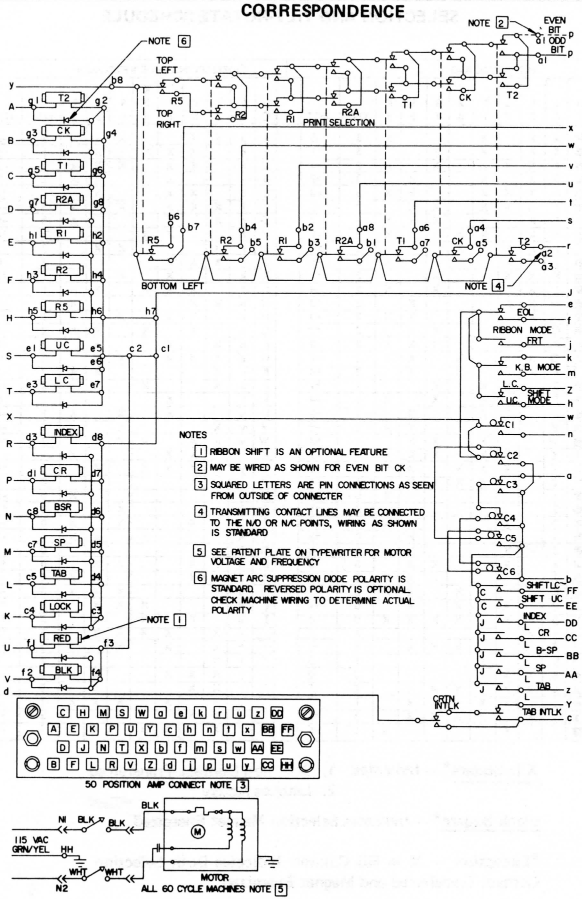
*With one exception, home position (Zero Rotate) selection on the 73 Series is identical to the 72 Series — i.e., no rotate latches are active. On the BCD machine, home position, during zero tilt only (0 & >), is selected by the cancellation method — i.e., all rotate latches are active (see the Selection and Tilt Rotate Schedule).

On the BCD machine only, the symbol > (Greater Than) may be used to check typehead homing.



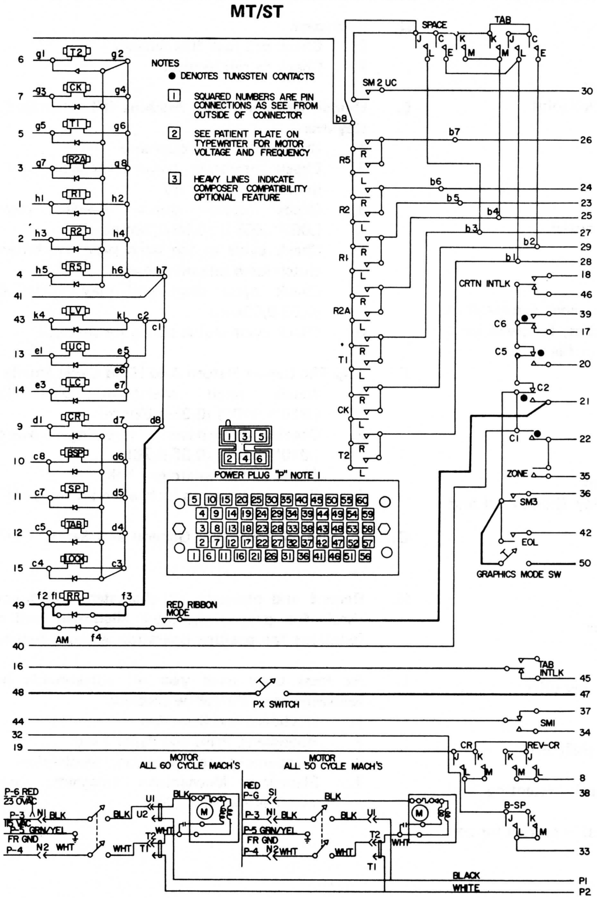
NOTES

1 RIBBON SHIFT IS AN OPTIONAL FEATURE
2 SQUARED LETTERS ARE PIN CONNECTIONS AS SEEN FROM OUTSIDE OF CONNECTOR
3 MAY BE WIRED AS SHOWN FOR EVEN BIT CHECK
4 SEE PATENT PLATE ON TYPEWRITER FOR MOTOR VOLTAGE AND FREQUENCY
5 MAGNET ARC SUPPRESSION DIODE POLARITY AS SHOWN IS STANDARD. REVERSED POLARITY IS OPTIONAL. CHECK MACHINE WIRING TO DETERMINE ACTUAL POLARITY



NOTES

1 RIBBON SHIFT IS AN OPTIONAL FEATURE
2 MAY BE WIRED AS SHOWN FOR EVEN BIT CK
3 SQUARED LETTERS ARE PIN CONNECTIONS AS SEEN FROM OUTSIDE OF CONNECTER
4 TRANSMITTING CONTACT LINES MAY BE CONNECTED TO THE N/O OR N/C POINTS, WIRING AS SHOWN IS STANDARD
5 SEE PATENT PLATE ON TYPEWRITER FOR MOTOR VOLTAGE AND FREQUENCY
6 MAGNET ARC SUPPRESSION DIODE POLARITY IS STANDARD. REVERSED POLARITY IS OPTIONAL. CHECK MACHINE WIRING TO DETERMINE ACTUAL POLARITY



MT/ST

NOTES
- ● DENOTES TUNGSTEN CONTACTS
- 1 SQUARED NUMBERS ARE PIN CONNECTIONS AS SEE FROM OUTSIDE OF CONNECTOR
- 2 SEE PATIENT PLATE ON TYPEWRITER FOR MOTOR VOLTAGE AND FREQUENCY
- 3 HEAVY LINES INDICATE COMPOSER COMPATIBILITY OPTIONAL FEATURE

BROKEN TAPES CHECK

Rotate Tapes

1. Rotate detent clearance
2. Roller on detent actuating lever
3. Print shaft timing
4. Shift interlock adjustments
5. Defective rotate arm and shift arm pulleys
6. Tape guide
7. Negative latch clearance insufficient
8. Latch links: too long/too short
9. Popping latches
10. Latch angle
11. Interference between tilt and rotate pulleys
12. Broken or sticking rotate spring
13. Binding type element
14. Shift arm/cord tension pulley bracket or carrier return interlock contact shield
15. Chips in rotate pulley

Tilt Tape

1. Detent to tilt ring clearance
2. Burrs on tilt pulley
3. Binds in tilt ring
4. Sector gear
5. Print shaft timing
6. Tilt pulley spring (off or broken)
7. Interference between tilt and rotate pulleys
8. Loose detent follower
9. Tilt tape/carrier shoe eccentric stud

INSPECTION PROCEDURE

Suggested Procedure

- A. Note operator's comments.
- B. Power clean the printer with the covers removed.
- C. Clean the feed rolls, platen, deflector, card-holder elements and exposed metal parts.
- D. Lubrication
- E. Machine Check
- F. Clean Covers

Lubrication:

Lubrication should be applied only in quantities sufficient to lubricate the bearing areas immediately involved. In no case should lubrication be applied so freely as to cause migration or spin-off onto electrical or rubber components.

Machines with power on 24 hours daily require more frequent lubrication. The following areas are primarily affected by idling time, since only the operational shaft is being driven:

1. Motor
2. Cycle Clutch
3. Center Bearing
4. Operational Cam Bearings
5. Operational Shaft Support (15" Machines)
6. Operational Shaft Bearing
7. Shift Clutch

Since these machines are hot 24 hours a day, some lubricant evaporation can be expected in areas not driven during idling.

No. 10 Oil

1. All bearings, rollers, wick and pivot points
2. Motor (once each year)

No. 23 Grease

1. All cam surfaces
2. All sliding surfaces
3. Cycle clutch and shift clutch springs
4. Upper and lower ball sockets and ball joint
5. All latching surfaces
6. Feed roll pivots
7. Gear train

Do Not Lubricate

1. Nylon or nylatron parts except as noted
2. Electrical components

NOTE: To clean contacts, use bond paper saturated in IBM cleaning fluid or SMS card lubricant, followed by a strip of dry bond paper; do not burnish or file.

MACHINE CHECK

A. Remove Type Element

1. Look for a worn type element
2. Check upper ball socket play (horizontal and vertical)
3. Check tilt ring side play
4. Check carrier shoe clearance
5. Check carrier side play

B. Half-Cycle Neg. 5 No Tilt Character

1. Check rotate spring tension
2. Check tilt detent side play
3. Check tilt homing – correct any drift

C. Replace Type Element

1. Check rotate for binds (pull shift arm)
2. Check skirt clearance
3. Half-cycle WTORM – check detenting and rotate detent side play
4. Half-cycle WTOM (solid arm) – correct for any drift over .020" (0,51mm)
5. Check timing on M

D. Backspace

1. Check B/S rack free motion
2. Check carrier motion

E. Unlock Keyboard With Machine Off–Depress Center Keylever

1. Check filter shaft clearance
2. Check interposer travel after latching (.015" minimum) (0,38mm)
3. Check cycle clutch keeper clearance (.002"-.008") (0,05-0,20mm)
4. Check cycle clutch latch pawl overthrow and clutch latch bite on sleeve
5. Check cycle shaft end play (.001"-.003") (0,03-0,08mm)
6. Check cycle clutch spring for slippage

F. Trip The Carrier Return And Hand Cycle Slowly

1. Watch latch overthrow past keeper (.010"-.040") (0,25-1,02mm)
2. Check interposer restoring overthrow (.010"-.030") (0,25-0,76)
3. Check clutch unlatching link
4. Reset keyboard to lock when power is off

G. Be sure all applicable General and Safety CEMs are installed.

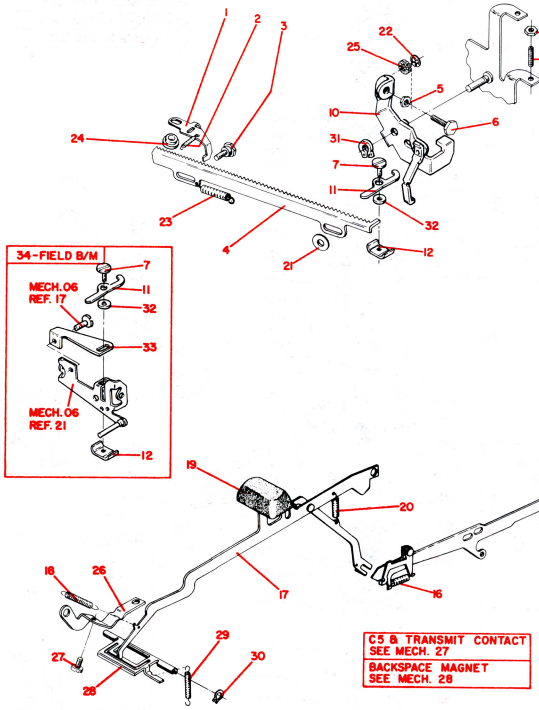
H. Record and playback all characters and functions; check for proper character alignment and check functions for positive operation without hestitation.

I. At least once each year all adjustments in the following areas should be checked:

1. Keyboard and Selection
2. Alignment, Print and Paper Feed
3. Escapement and Operational Mechanism
4. Electrical Mechanisms (magnets, contacts, switches and solenoids)

BACKSPACE

MECH. CODE 01



34-FIELD B/M

C5 & TRANSMIT CONTACT SEE MECH. 27

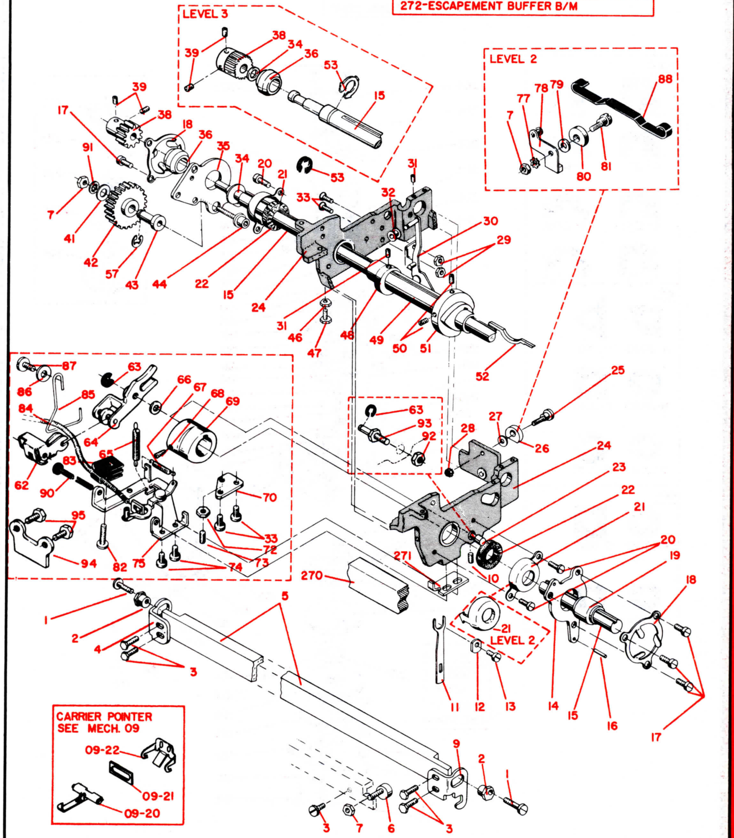
BACKSPACE MAGNET SEE MECH. 28

CARRIER

MECH. CODE 02

60-CARRIER & ROCKER ASM. COMPLETE B/M

272-ESCAPEMENT BUFFER B/M

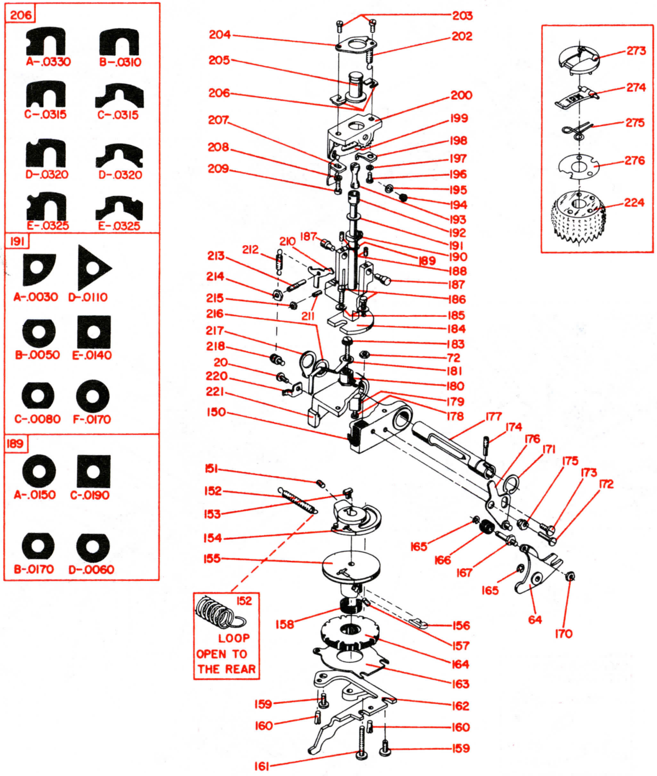


CARRIER POINTER SEE MECH. 09

MECH. CODE
02

ROCKER
(GEAR TILT)

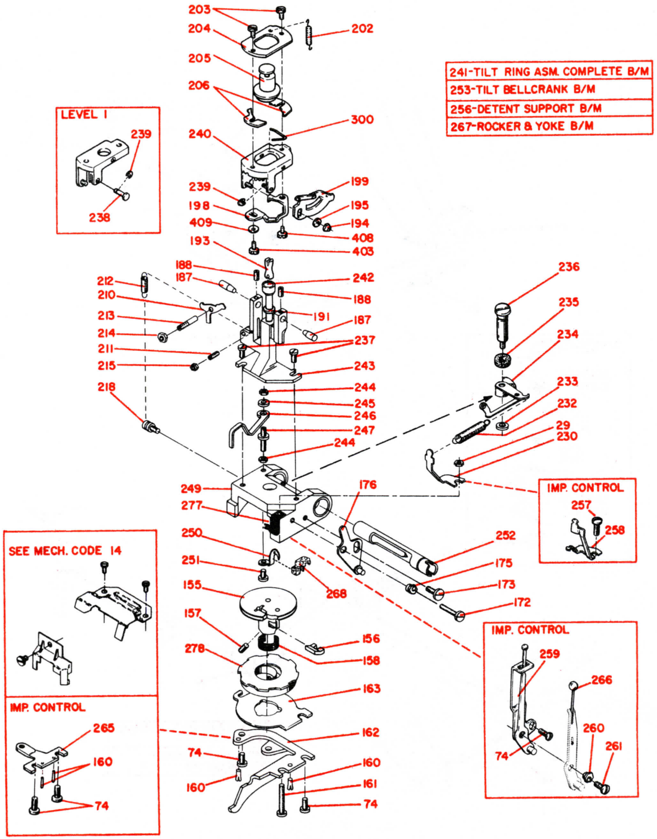
201 TILT RING ASM. COMP.



MECH. CODE
02

ROCKER
(GEARLESS TILT)

241-TILT RING ASM. COMPLETE B/M
253-TILT BELLCRANK B/M
256-DETENT SUPPORT B/M
267-ROCKER & YOKE B/M

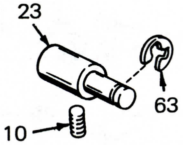


PRINT CAM FOLLOWER STUD

MECH. CODE 02

Pre-Dual Impression Machines

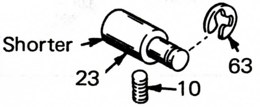
This stud, P/N 1124176, is used as a replacement part on all machines not equipped with dual impression which have the original "non-faced" carriers.



Early Dual Impression Machines

This stud, P/N 1175054, must be used on the early dual impression machines. The follower P/N 1141619, must also be replaced to ensure compatibility. This procedure is necessary because the early DI carriers were "non-faced." Note: Use washer, P/N 1164290, to reduce side play.

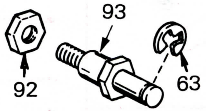
Part No.	Description
1175054	Stud, Fol. Mtg.



Pre-Dual Impression Machines With New Carrier

This stud, P/N 1164562, and nut, P/N 6503, must be used with a carrier change on all machines not equipped with dual impression. This is necessary because all field replacement carriers are "faced" and do not have a setscrew hole for mounting the original stud.

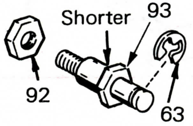
Part No.	Description
1164562	Stud, Fol. Mtg.
6503	Nut



Current Level Machines

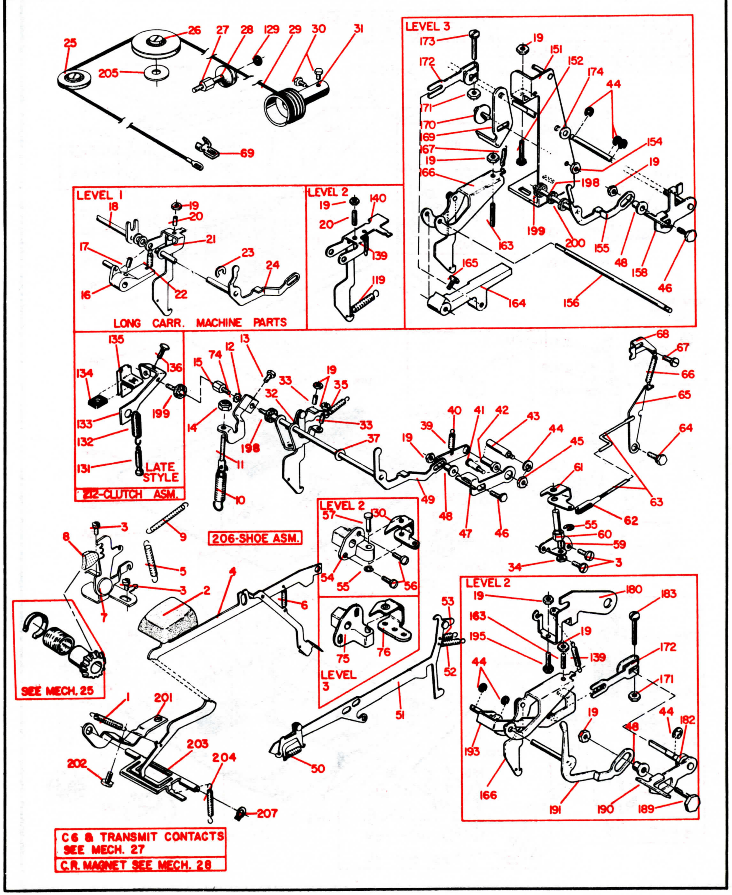
This stud, P/N 1164878, and nut, P/N 6503, can be used on all Dual Impression carriers that are "faced." It must be used with the new print cam follower, P/N 1141619.

Part No.	Description
1164878	Stud, Fol. Mtg.



CARRIER RETURN

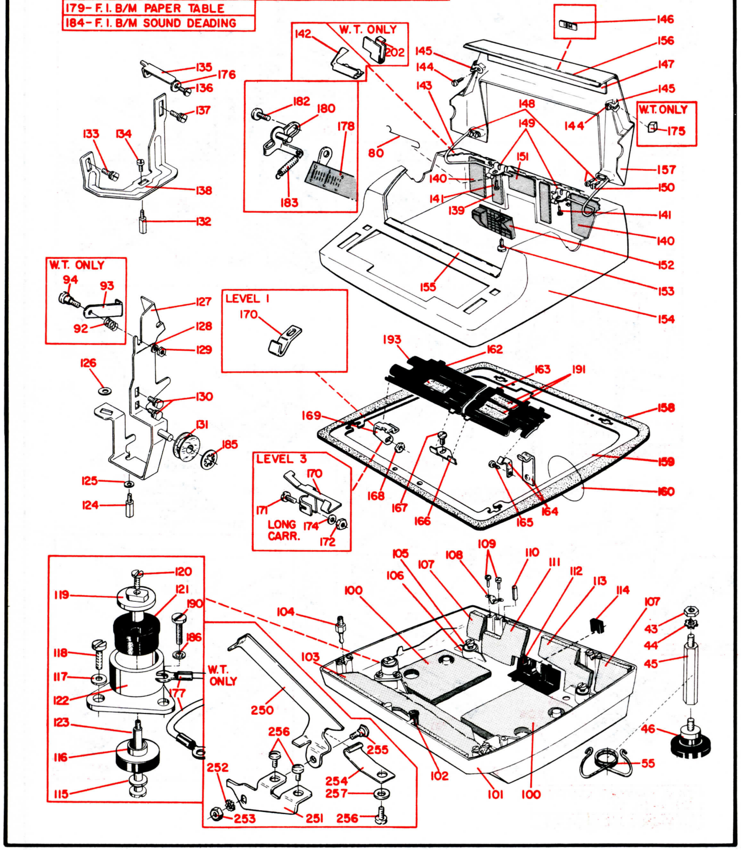
MECH. CODE 03



MECH. CODE
04

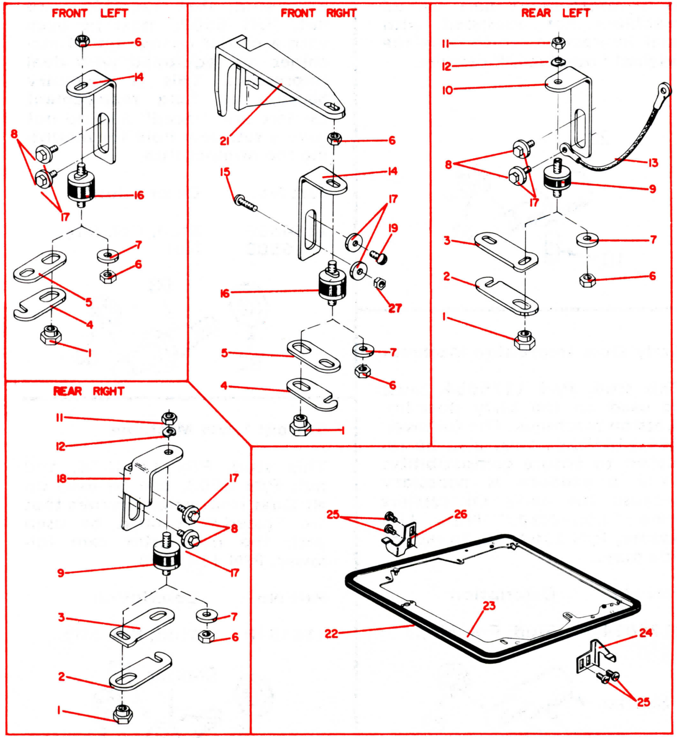
TILT UP COVERS

48-DUST COVER
173-F.I. B/M
179-F.I. B/M PAPER TABLE
184-F.I. B/M SOUND DEADING
192-TOP & CENTER COVER B/M
202-E.O.F. LOCKOUT PLATE



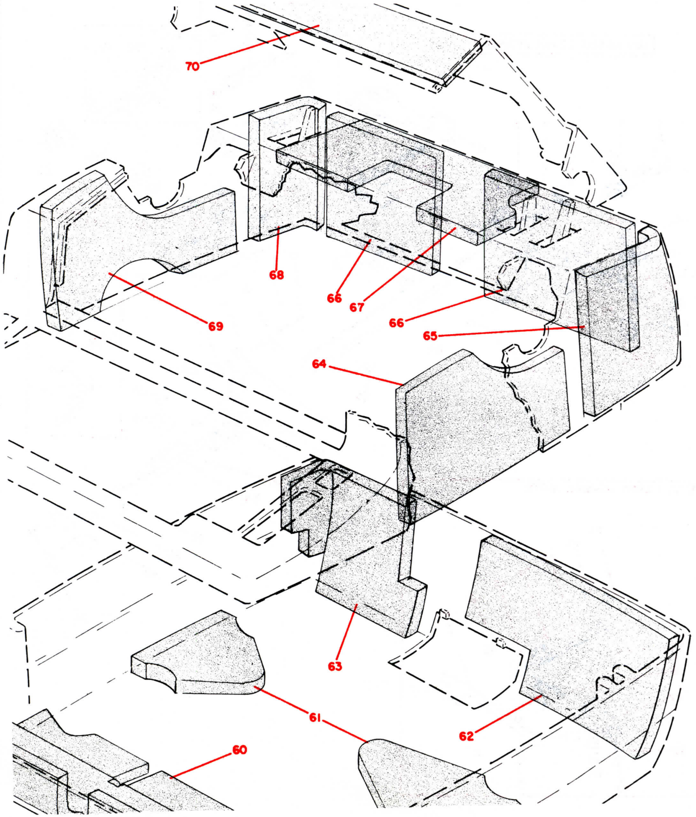
MECH. CODE
04

COVER MOUNTING



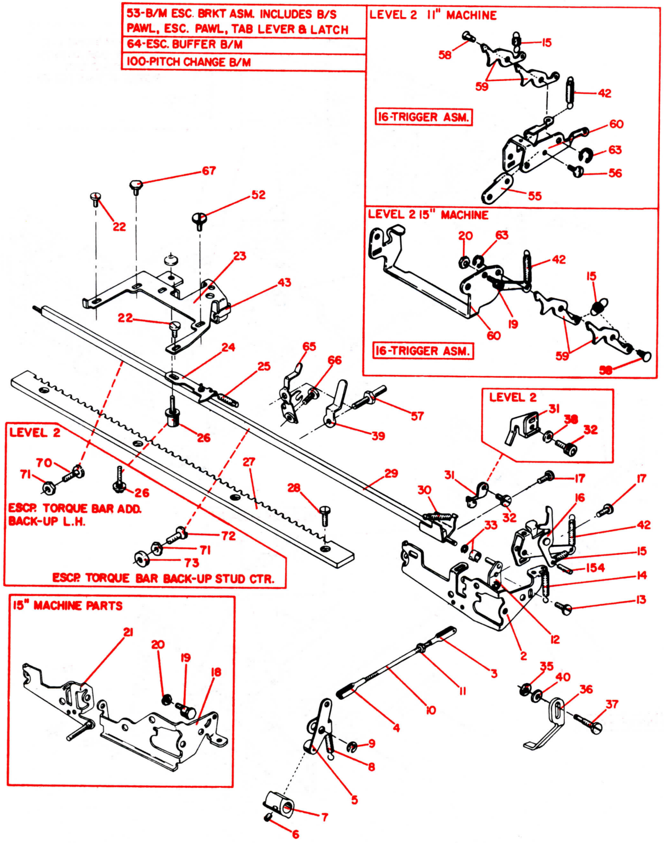
COVER INSULATION

MECH. CODE
04



ESCAPEMENT

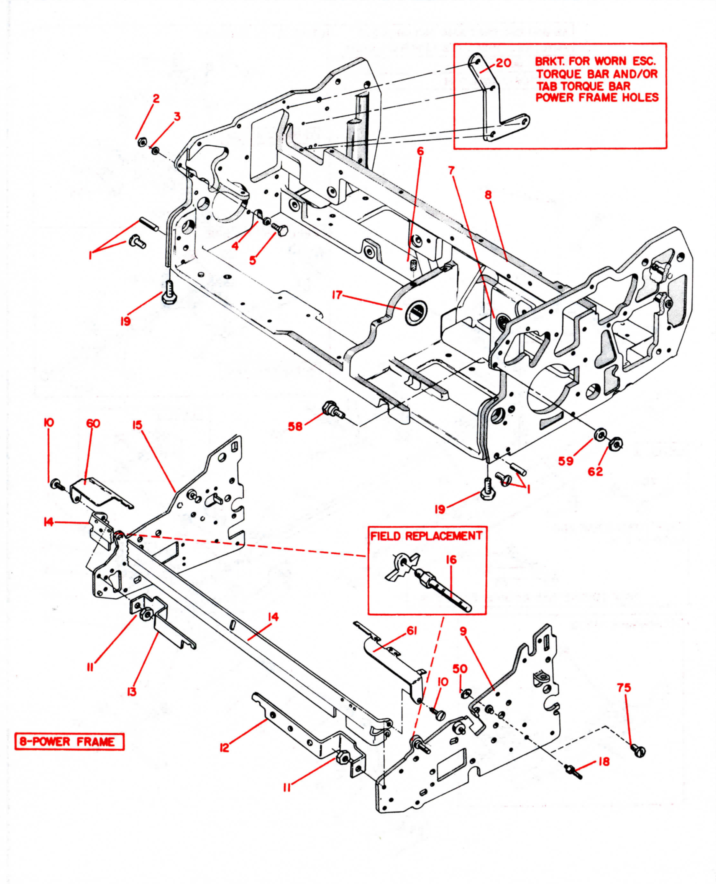
MECH. CODE
06


53-B/M ESC. BRKT ASM. INCLUDES B/S PAWL, ESC. PAWL, TAB LEVER & LATCH
64-ESC. BUFFER B/M
100-PITCH CHANGE B/M

MECH. CODE

08

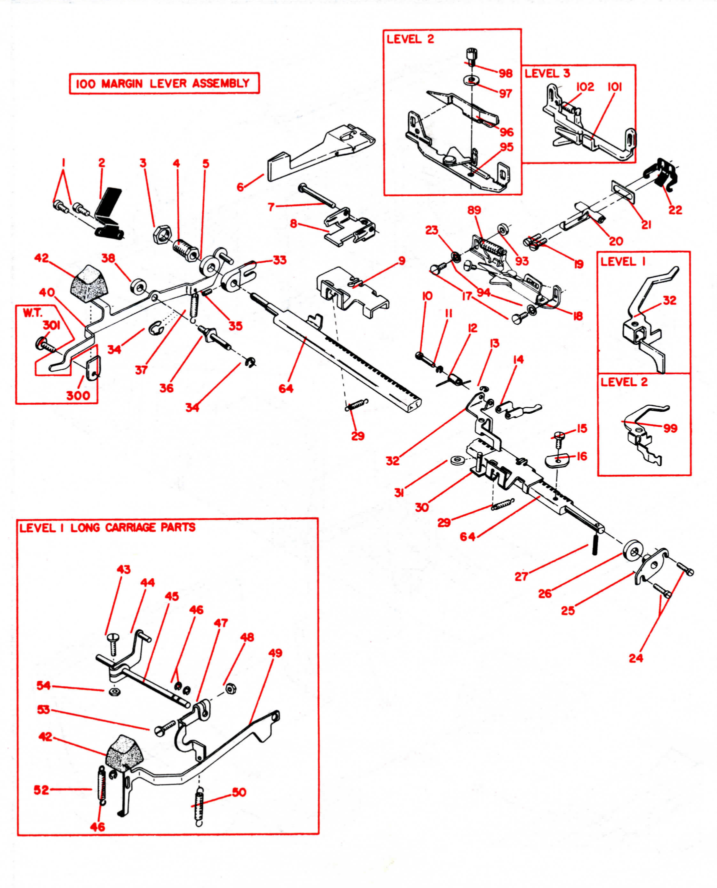
FRAMES



MECH. CODE

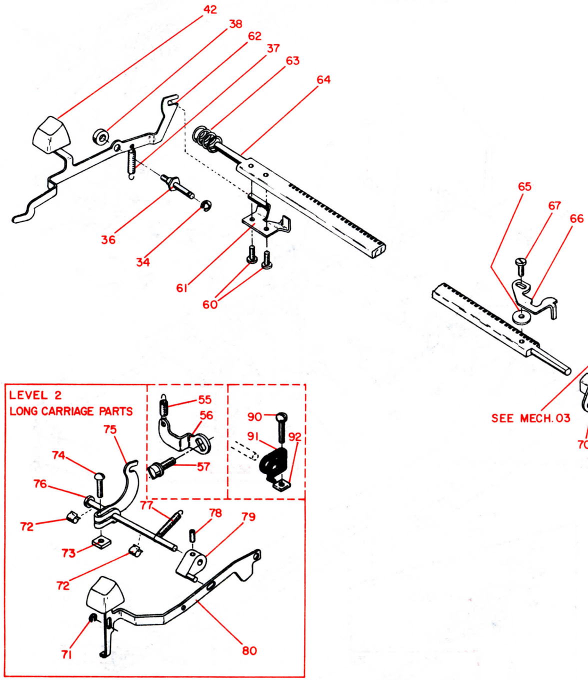
09

MARGINS



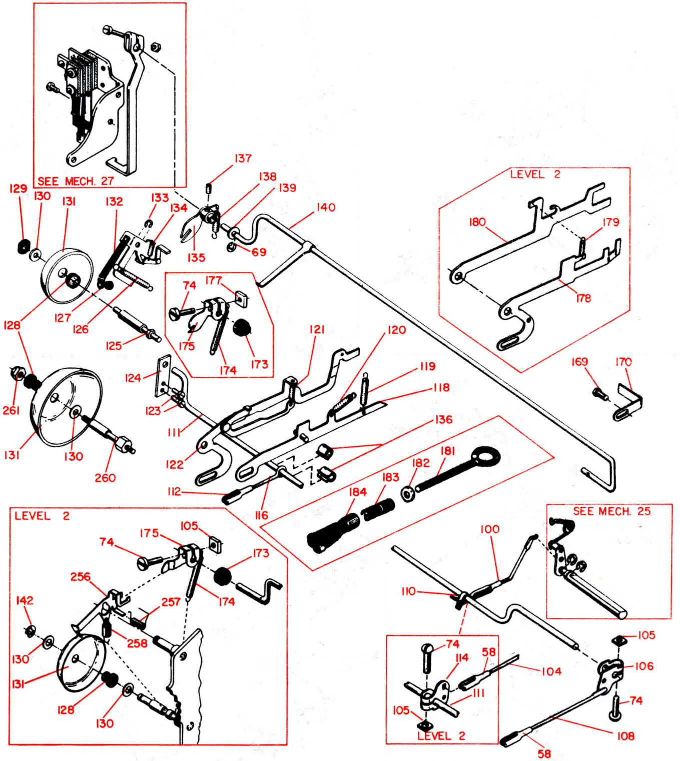
MARGINS

MECH. CODE
09



LINELOCK & BELL

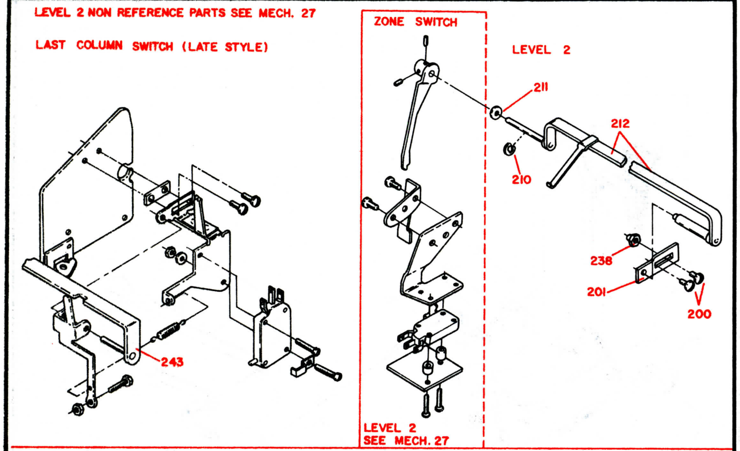
MECH. CODE
09

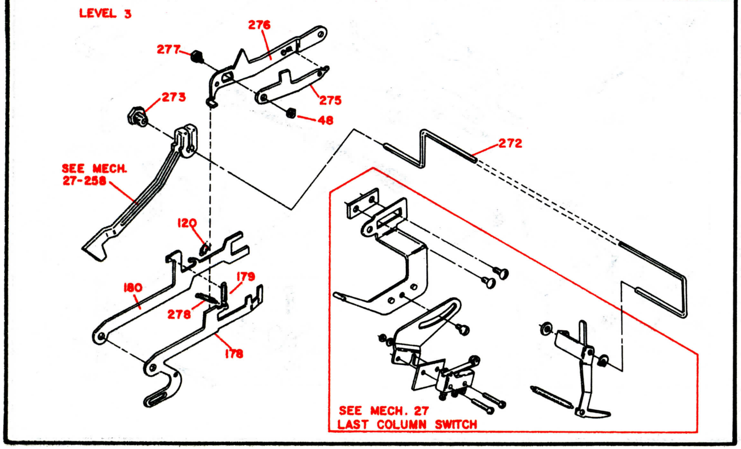


MECH. CODE

09

LINELOCK & BELL

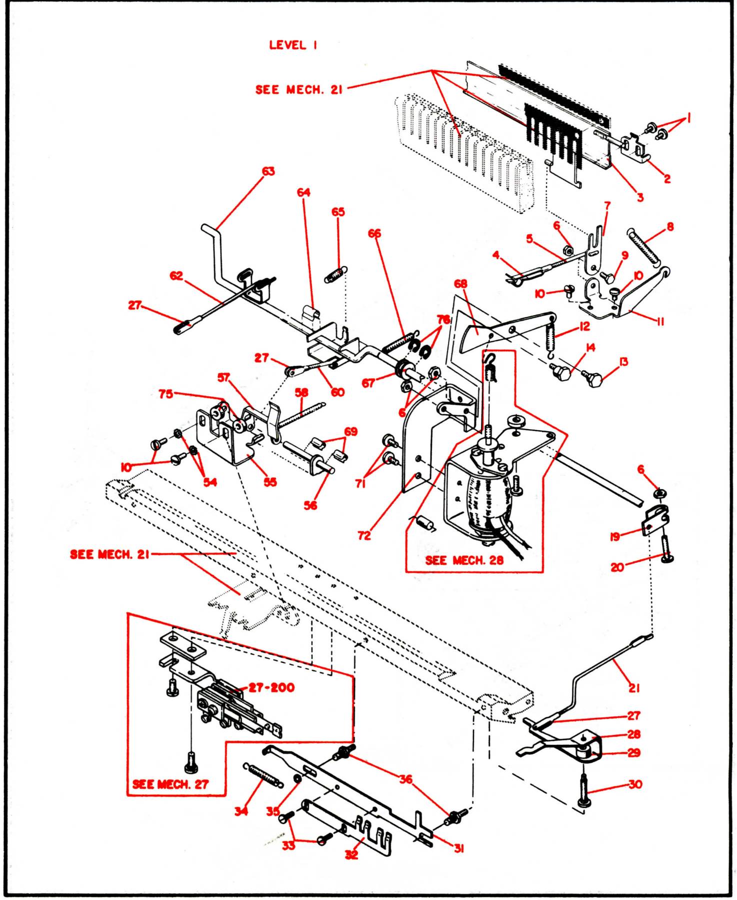

LEVEL 2 NON REFERENCE PARTS SEE MECH. 27
LAST COLUMN SWITCH (LATE STYLE)
243
ZONE SWITCH
LEVEL 2
SEE MECH. 27
LEVEL 2
211
212
210
238
201
200



MECH. CODE

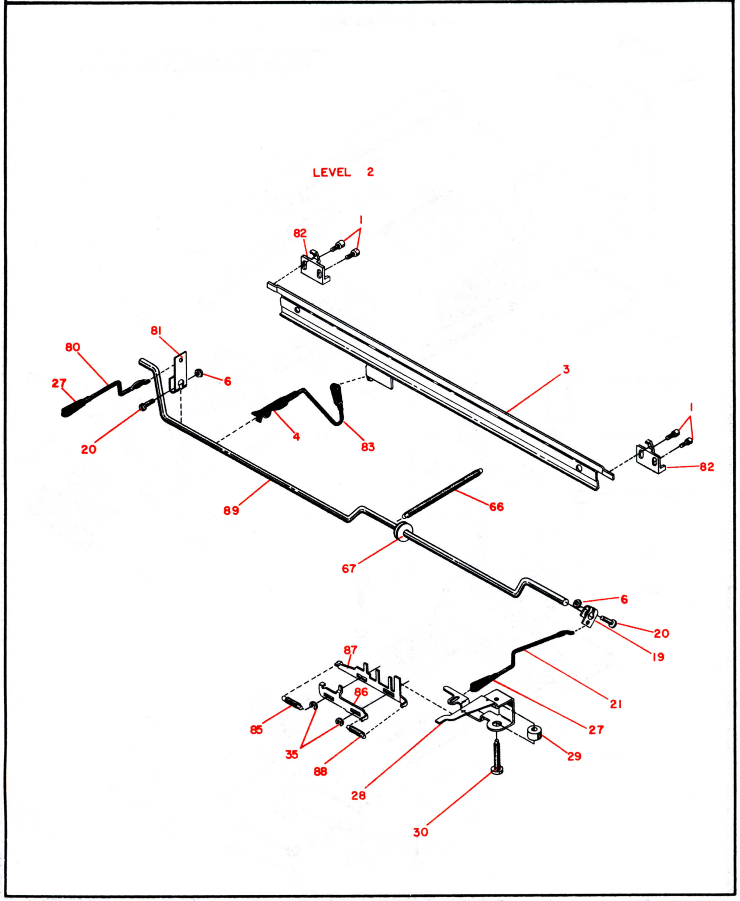
10

KEYBOARD LOCK



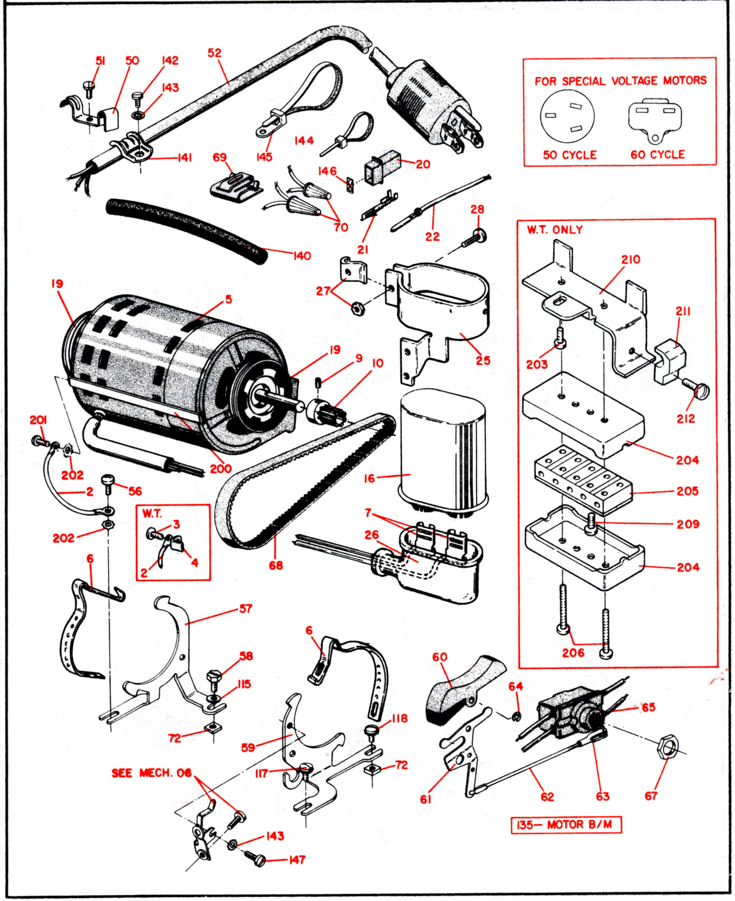
KEYBOARD LOCK

MECH. CODE
10



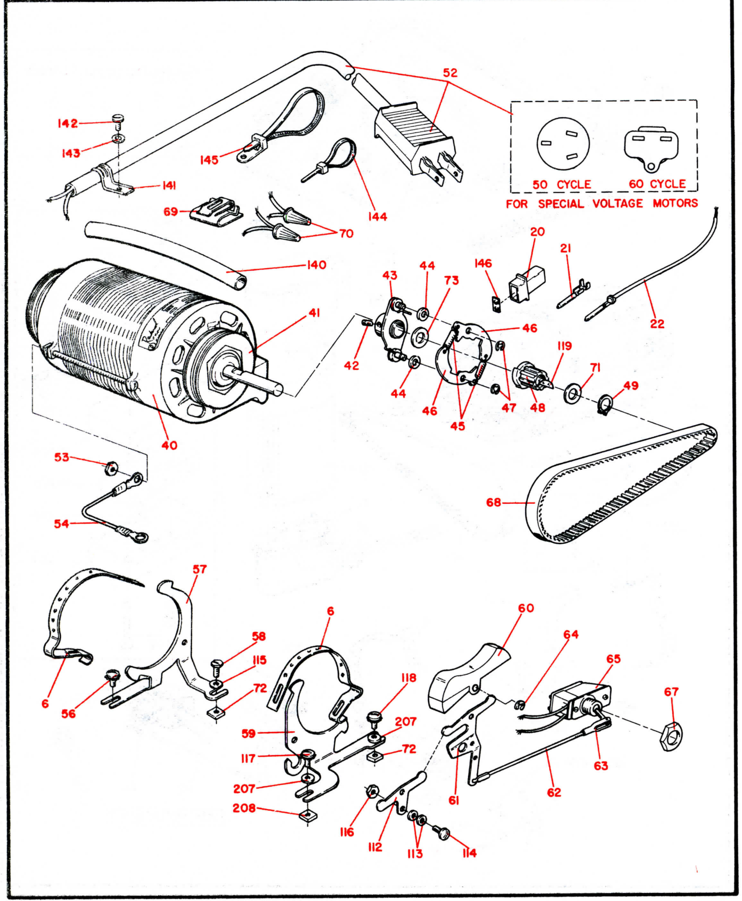
MOTOR & DRIVE

MECH. CODE
11



MECH. CODE 11

W.T. MOTOR & DRIVE

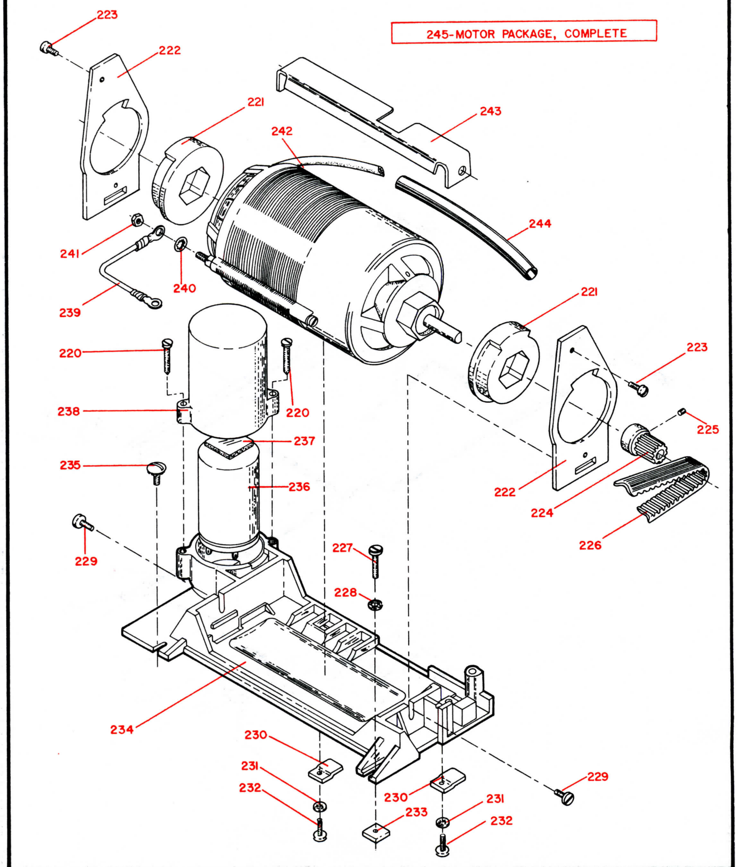


MECH. CODE 11

W.T. MOTOR & DRIVE

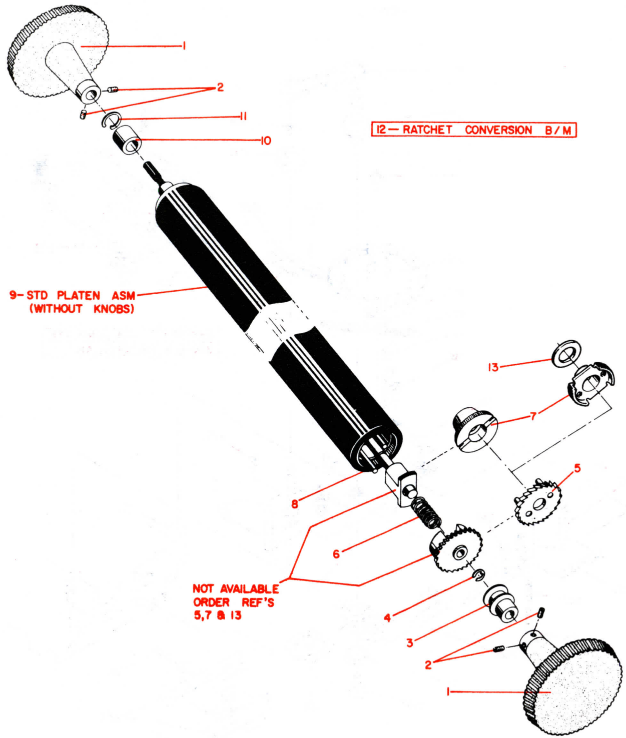
FOR 15" MACHINES ONLY

245-MOTOR PACKAGE, COMPLETE



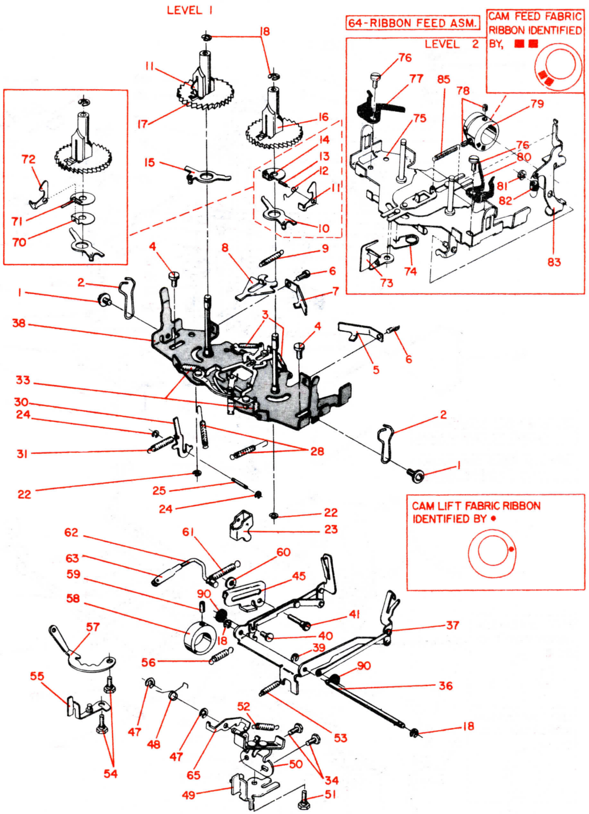
PLATEN

MECH. CODE
12



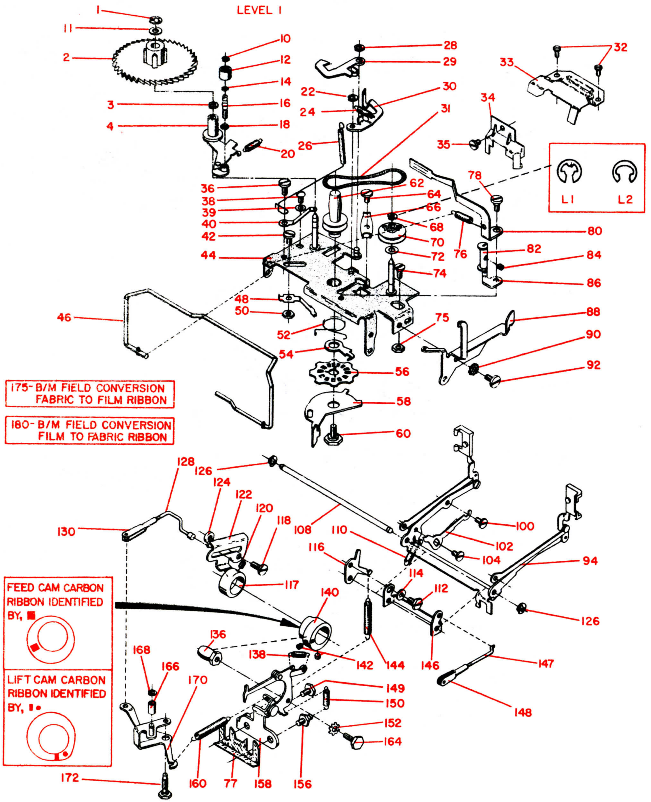
FABRIC RIBBON

MECH. CODE
13



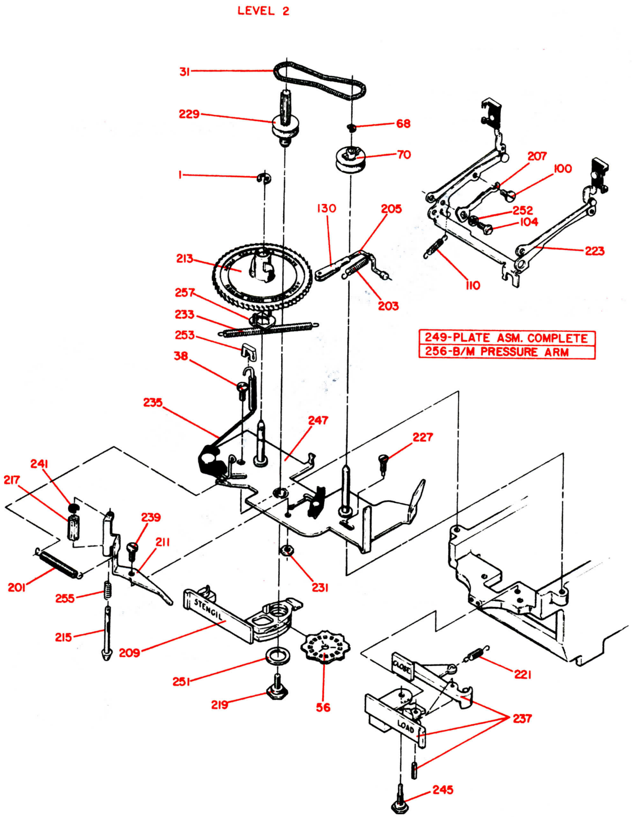
MECH. CODE
14

FILM RIBBON



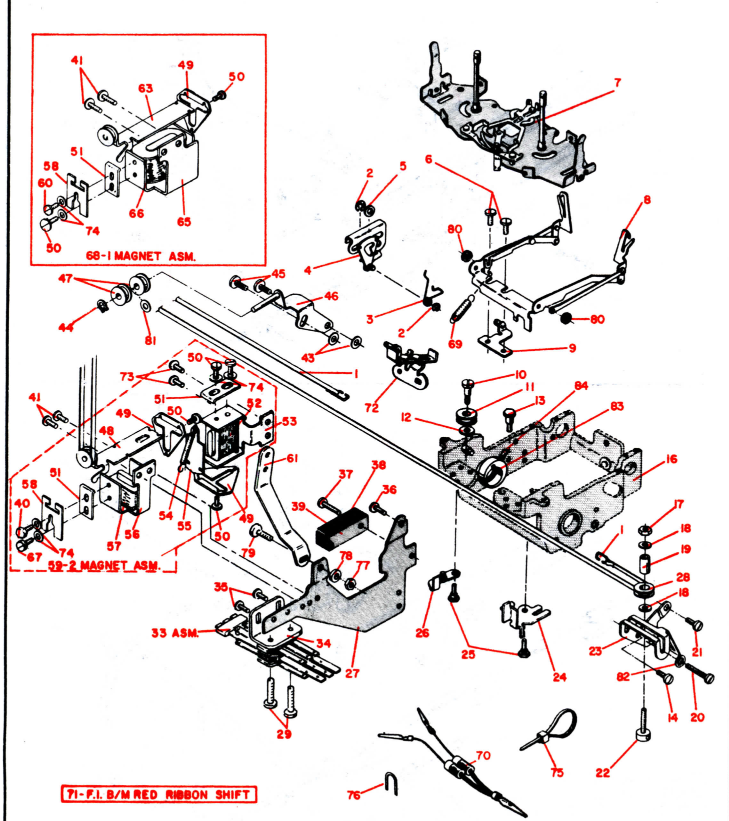
MECH. CODE
14

FILM RIBBON



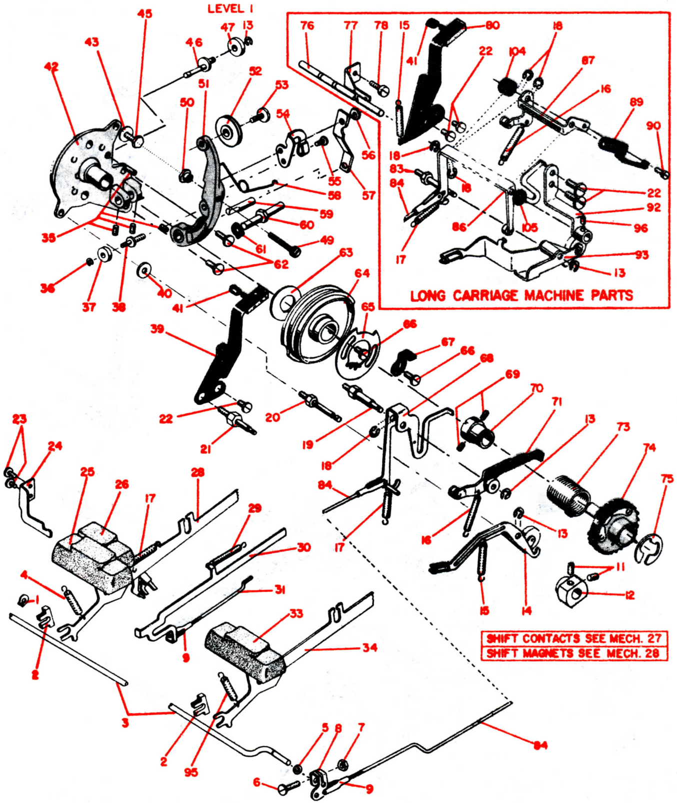
RED RIBBON SHIFT

MECH. CODE 15



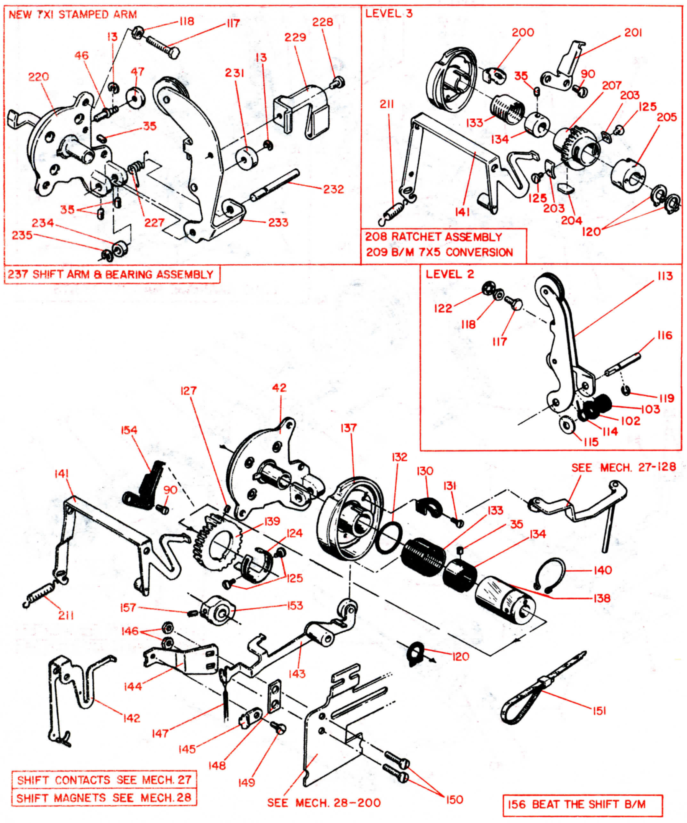
SHIFT

MECH. CODE 16


LEVEL I
LONG CARRIAGE MACHINE PARTS
SHIFT CONTACTS SEE MECH. 27
SHIFT MAGNETS SEE MECH. 28

MECH. CODE
16

SHIFT


NEW 7X1 STAMPED ARM

237 SHIFT ARM & BEARING ASSEMBLY

LEVEL 3

208 RATCHET ASSEMBLY
209 B/M 7X5 CONVERSION

LEVEL 2

SEE MECH. 27-128

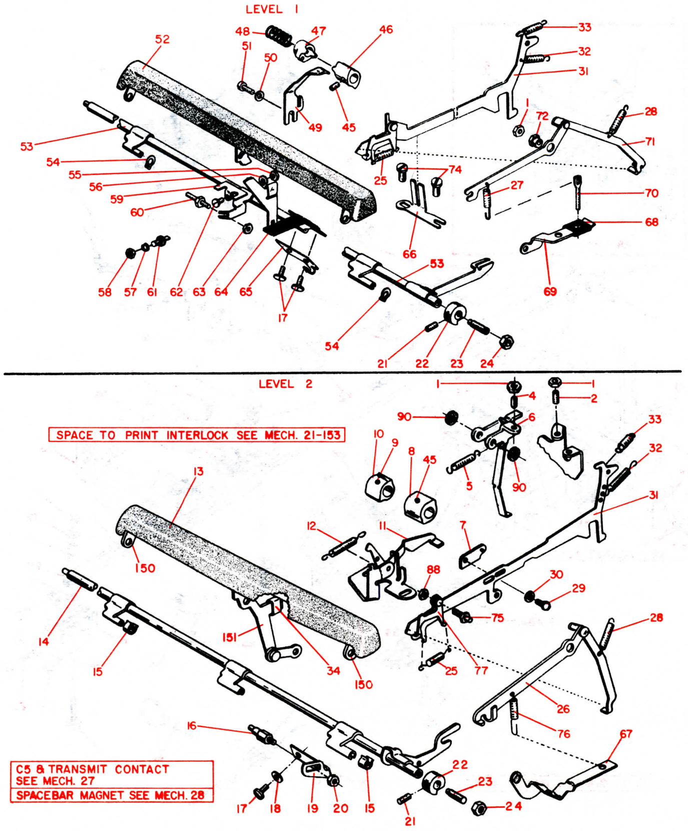
SHIFT CONTACTS SEE MECH. 27
SHIFT MAGNETS SEE MECH. 28

SEE MECH. 28-200

156 BEAT THE SHIFT B/M

MECH. CODE
17

SPACEBAR


LEVEL 1

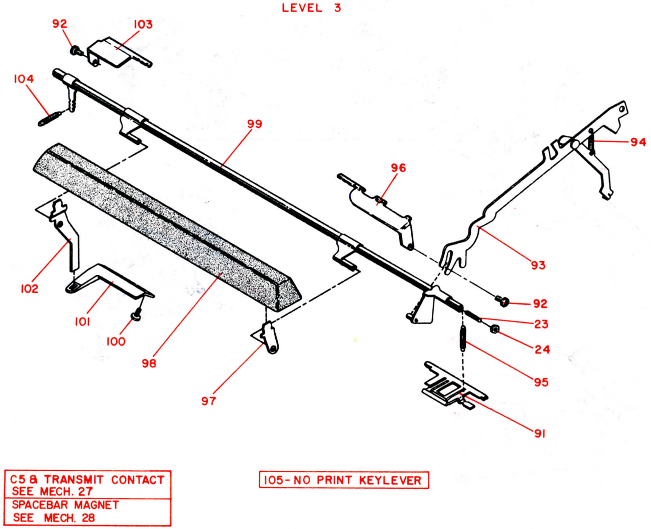
LEVEL 2

SPACE TO PRINT INTERLOCK SEE MECH. 21-153

C5 & TRANSMIT CONTACT
SEE MECH. 27
SPACEBAR MAGNET SEE MECH. 28

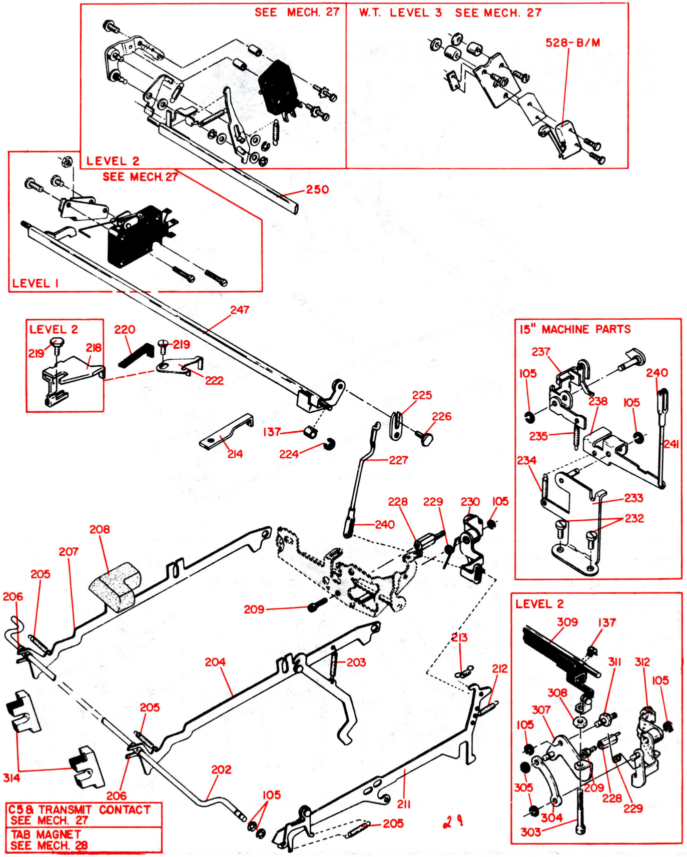
SPACEBAR

MECH. CODE
17



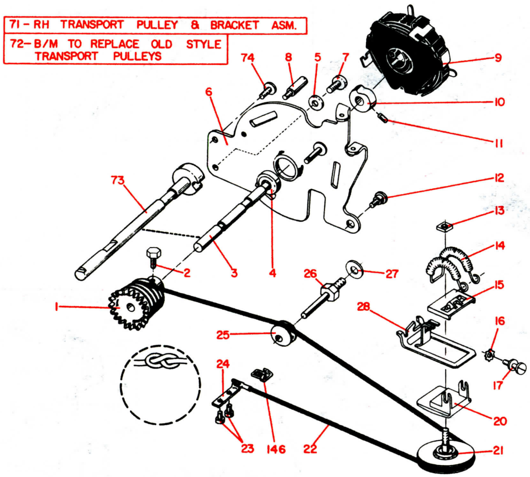
TAB

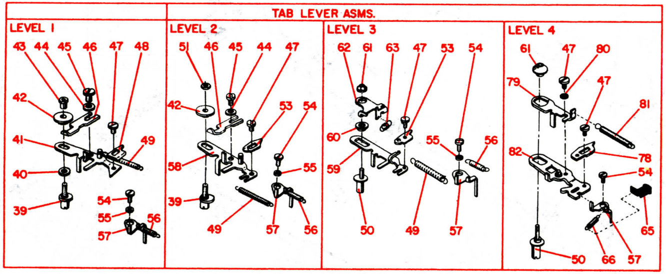
MECH. CODE
18



MECH. CODE
18

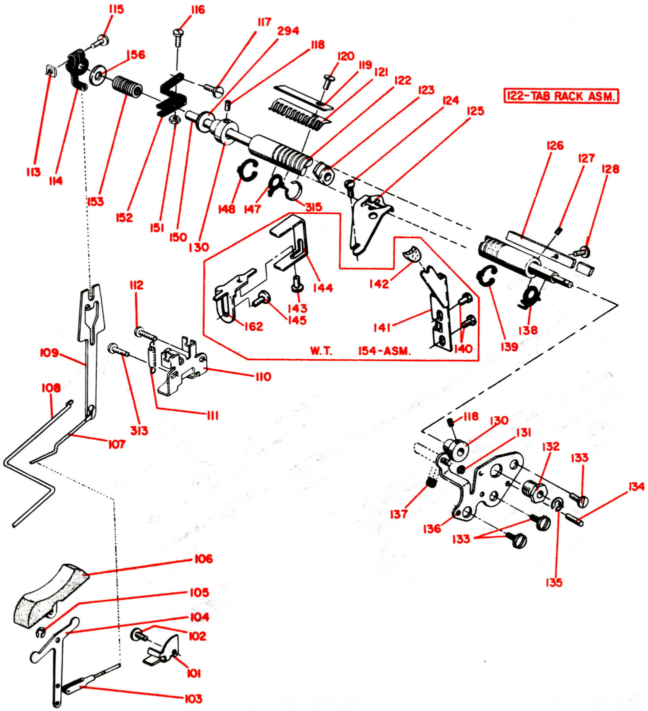
TAB


71 - RH TRANSPORT PULLEY & BRACKET ASM.
72- B/M TO REPLACE OLD STYLE TRANSPORT PULLEYS
74
8
5
7
9
6
10
11
73
12
13
14
2
3
4
26
27
15
1
28
16
25
24
17
20
23
146
22
21



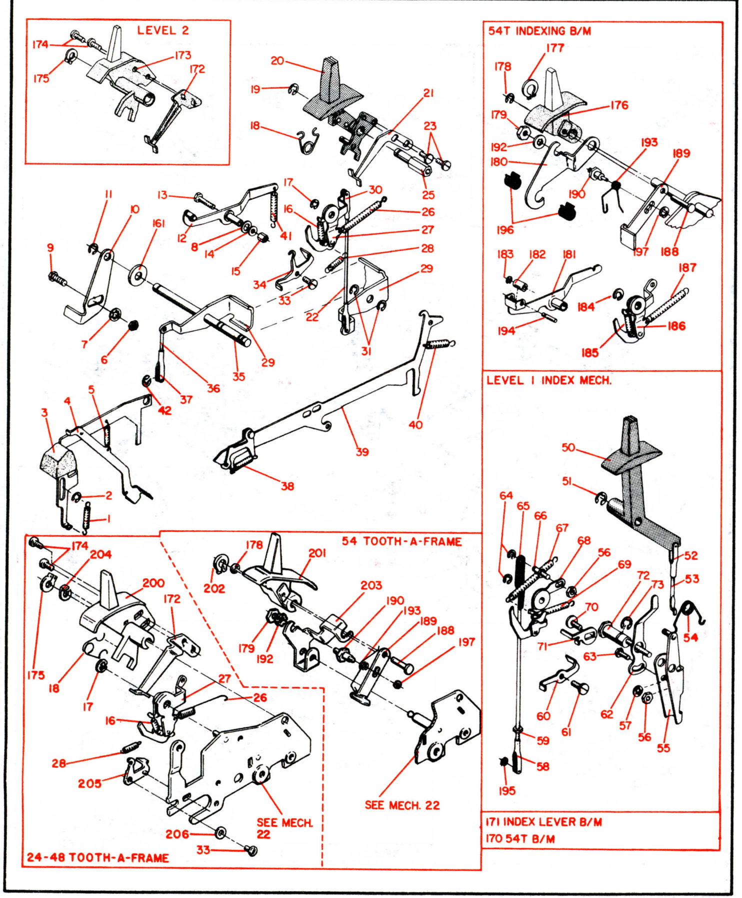
MECH. CODE
18

TAB



INDEX

MECH. CODE 20

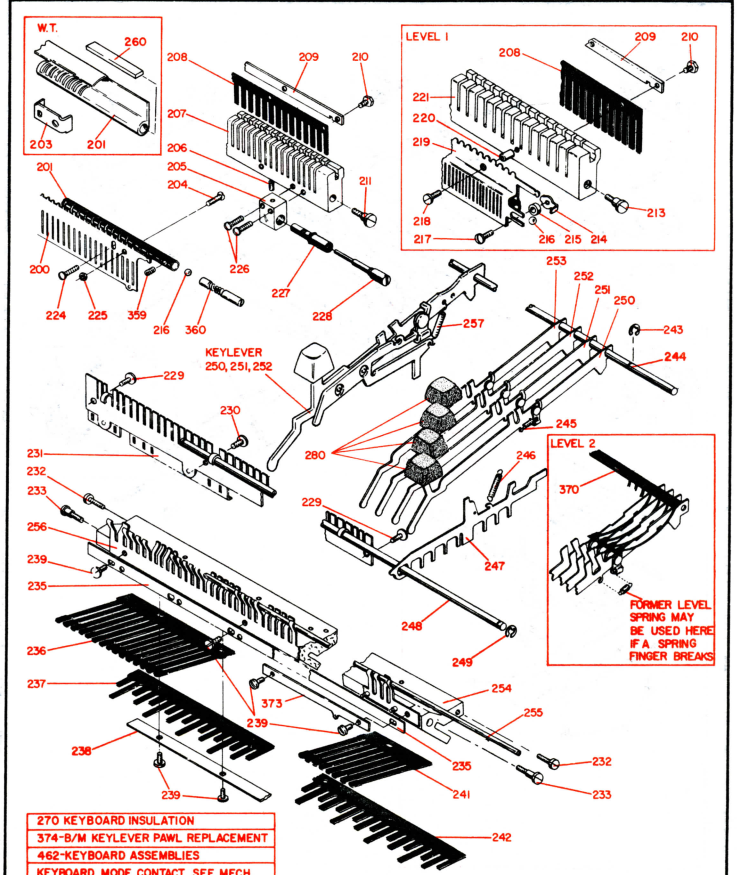


171 INDEX LEVER B/M

170 54T B/M

KEYBOARD SELECTION

MECH. CODE 21



270 KEYBOARD INSULATION

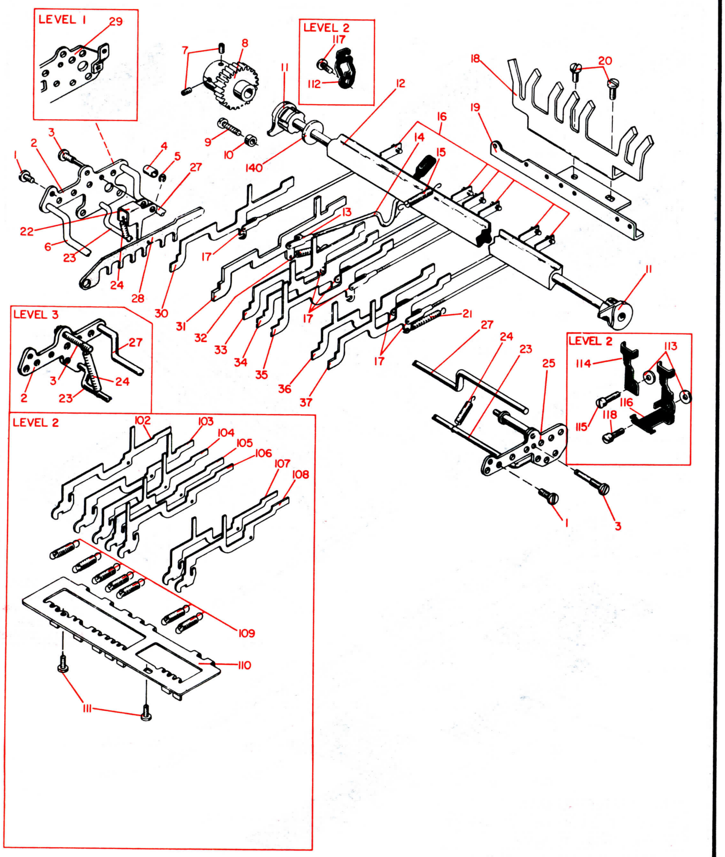
374-B/M KEYLEVER PAWL REPLACEMENT

462-KEYBOARD ASSEMBLIES

KEYBOARD MODE CONTACT SEE MECH. 27 REF. 200

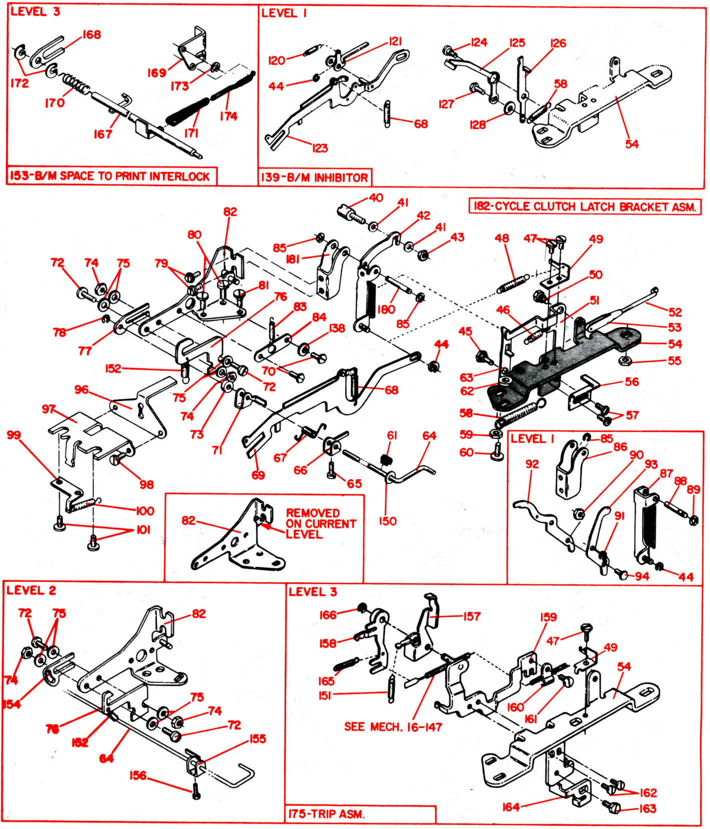
MECH. CODE
21

KEYBOARD SELECTION



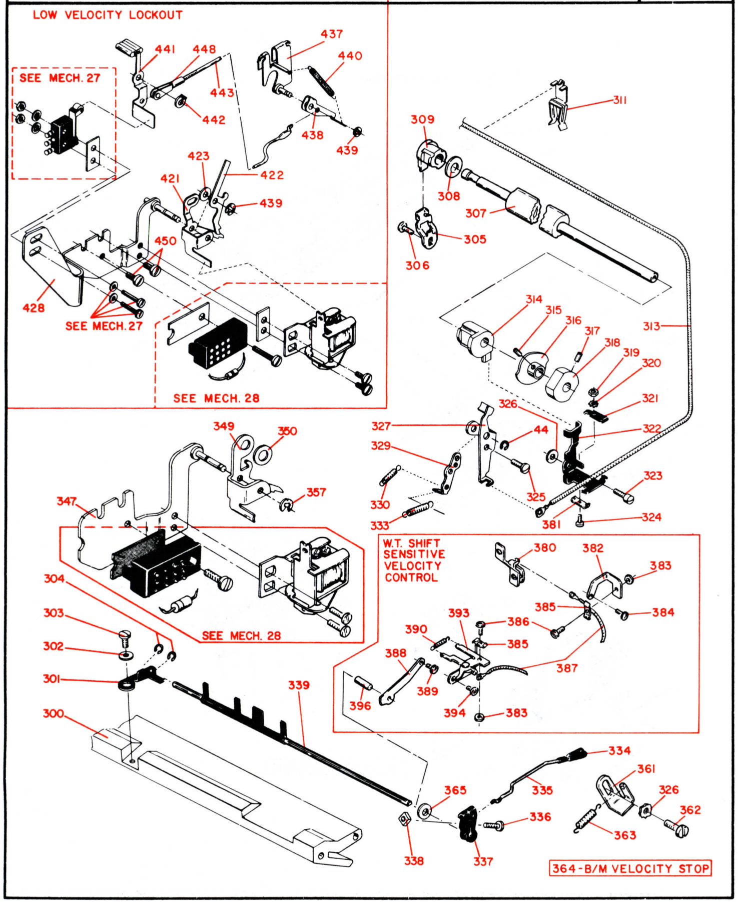
MECH. CODE
21

KEYBOARD SELECTION



KEYBOARD SELECTION

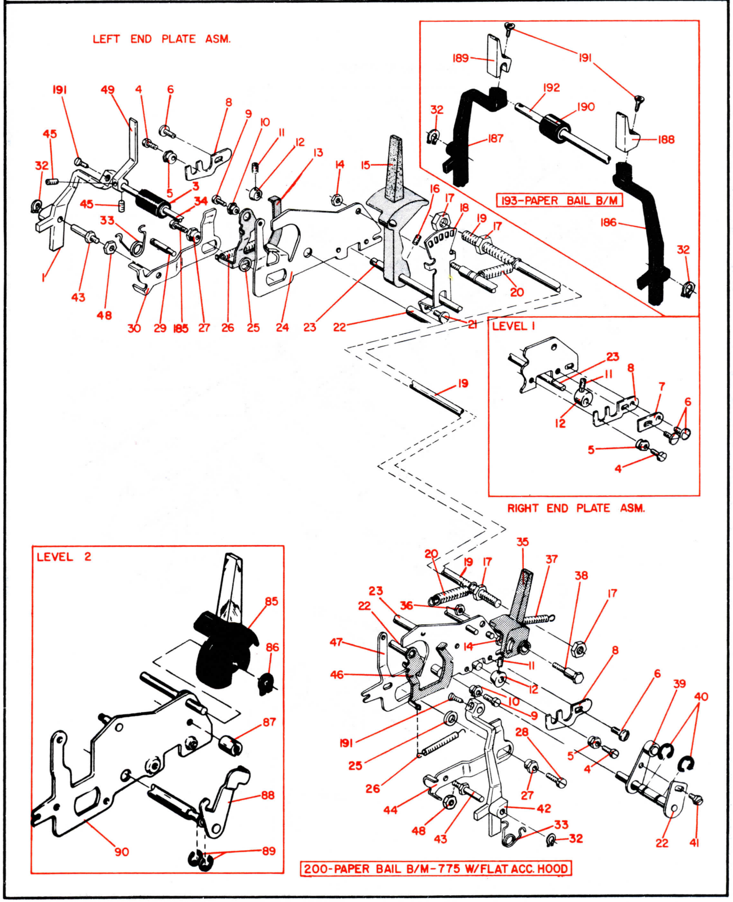
MECH. CODE 21



PAPER FEED

(TIE ROD)

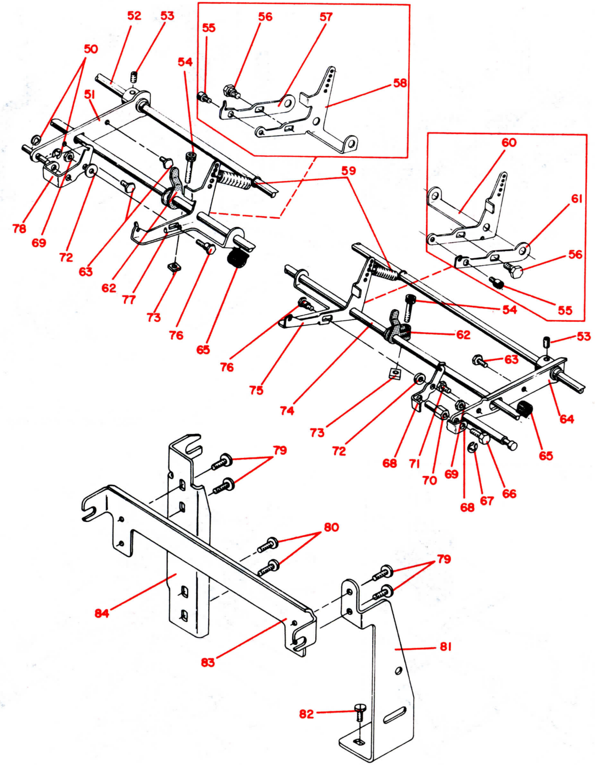
MECH. CODE 22



MECH. CODE
22

PAPER FEED
(TIE ROD)

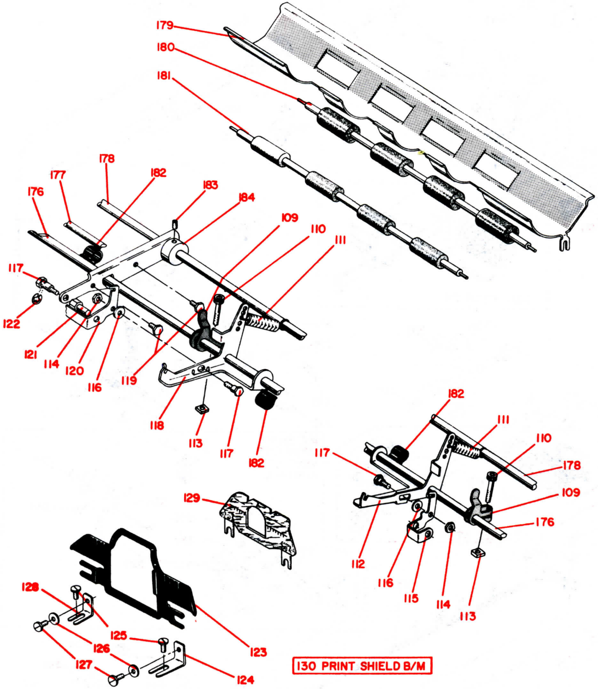
(CENTER TO RIGHT END)



MECH. CODE
22

PAPER FEED
(TIE ROD)

(LEFT END TO CENTER)

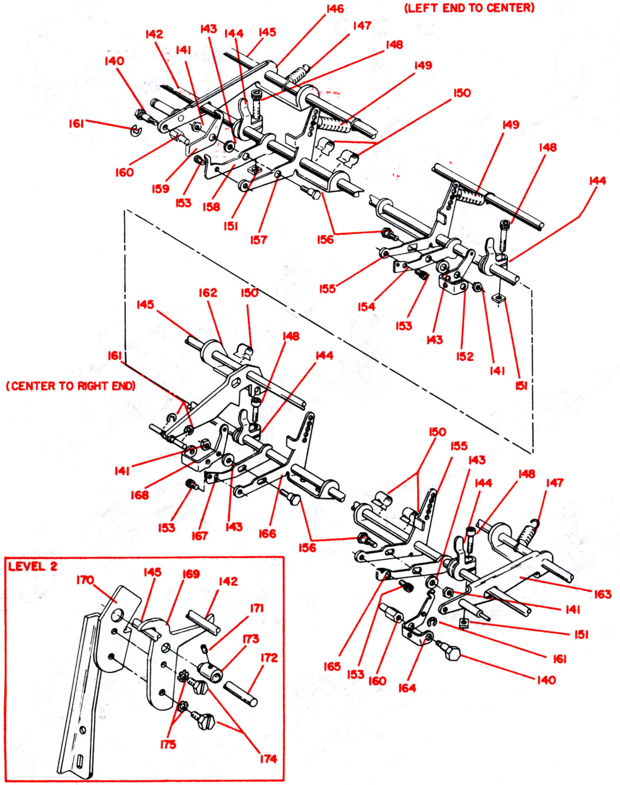


130 PRINT SHIELD B/M

PAPER FEED
(TIE ROD)

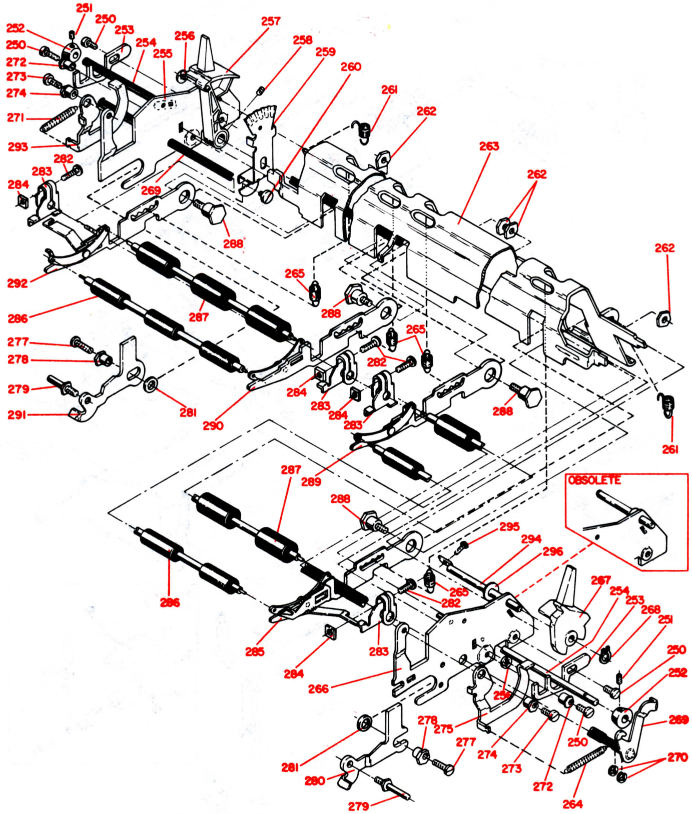
MECH. CODE
22

NOTE: THESE PARTS USED ABOVE 4086300-11 INCH, 4383500-15 INCH



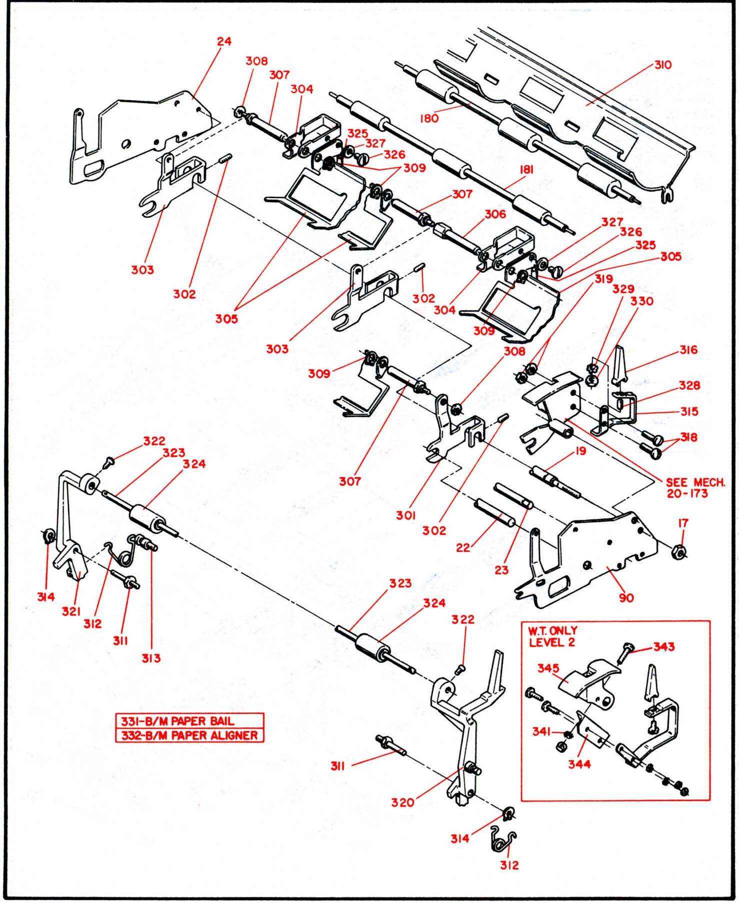
PAPER FEED
(A FRAME)

MECH. CODE
22



MECH. CODE
22

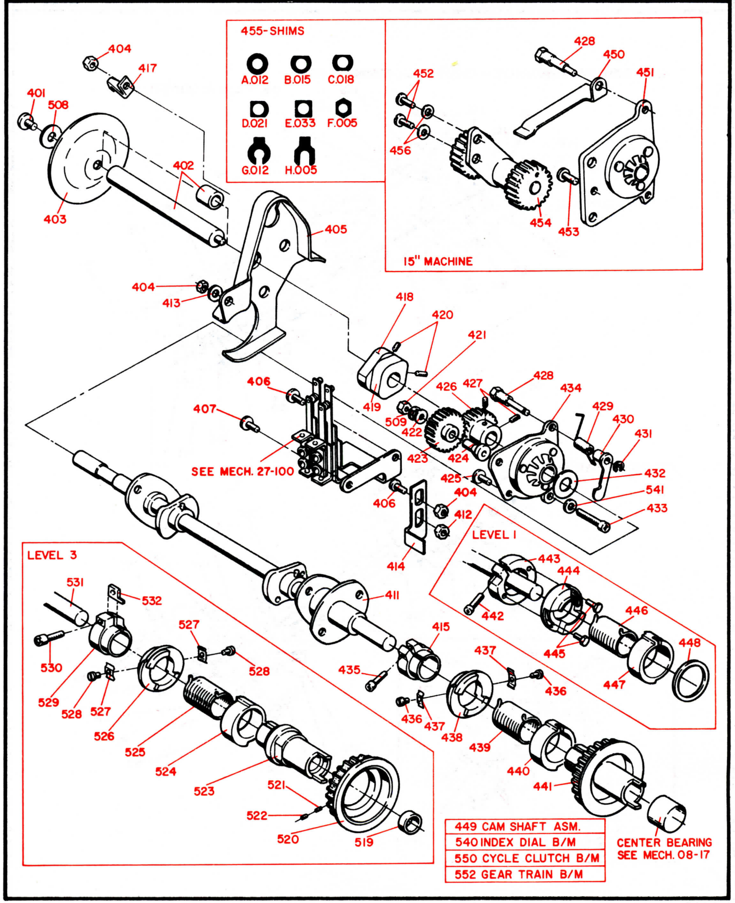
PAPER FEED
(ACCOUSTIC HOOD, PAPER STACKER)



331-B/M PAPER BAIL
332-B/M PAPER ALIGNER

MECH. CODE
23

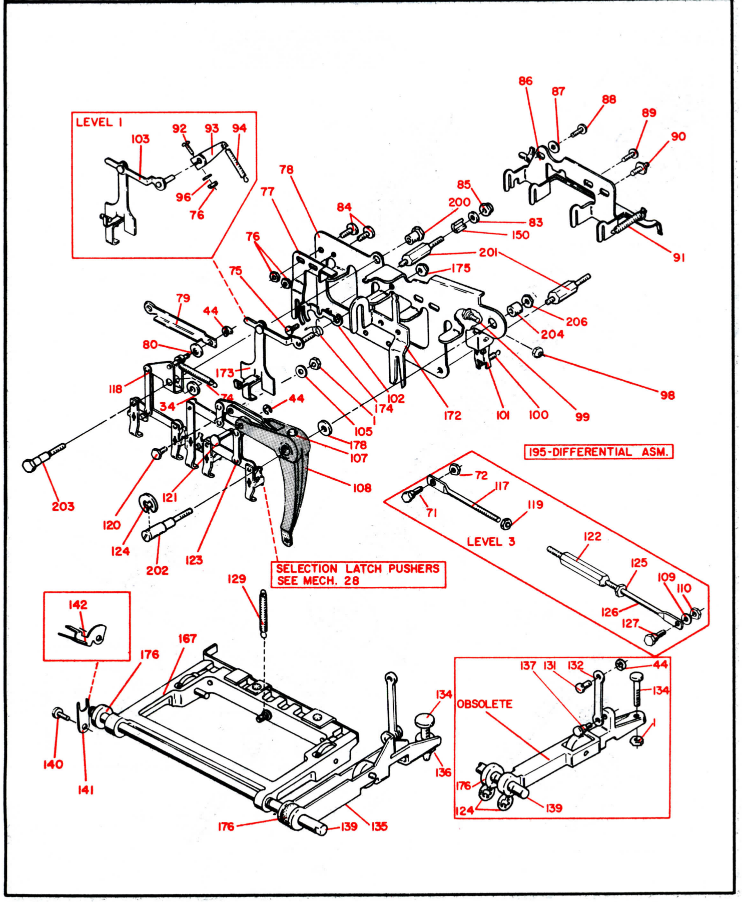
CYCLE SHAFT



449 CAM SHAFT ASM.
540 INDEX DIAL B/M
550 CYCLE CLUTCH B/M
552 GEAR TRAIN B/M

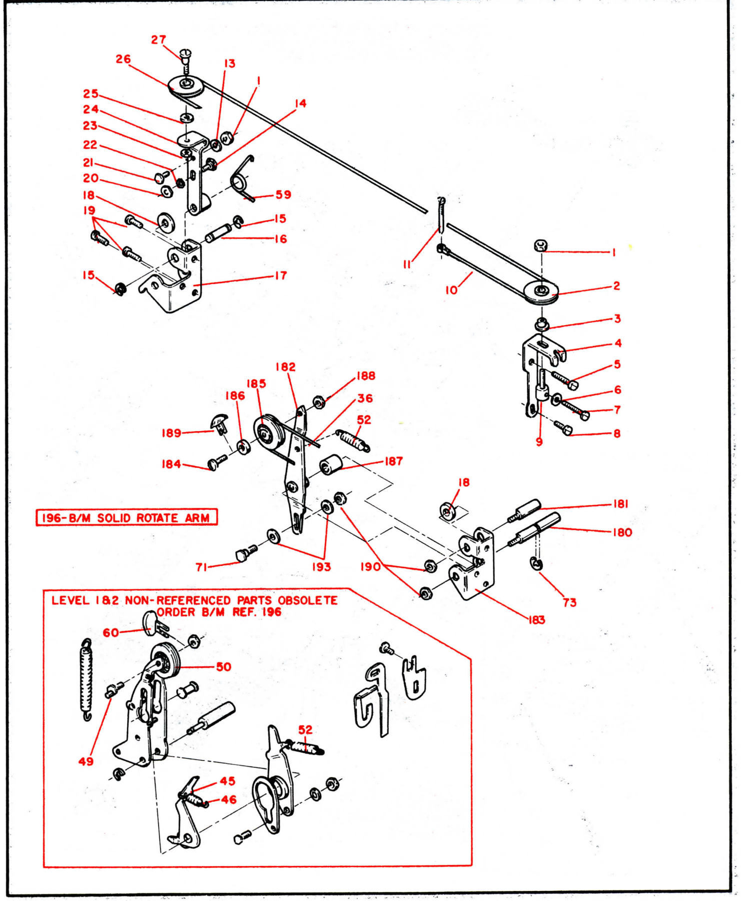
CHARACTER SELECTION

MECH. CODE
23



CHARACTER SELECTION

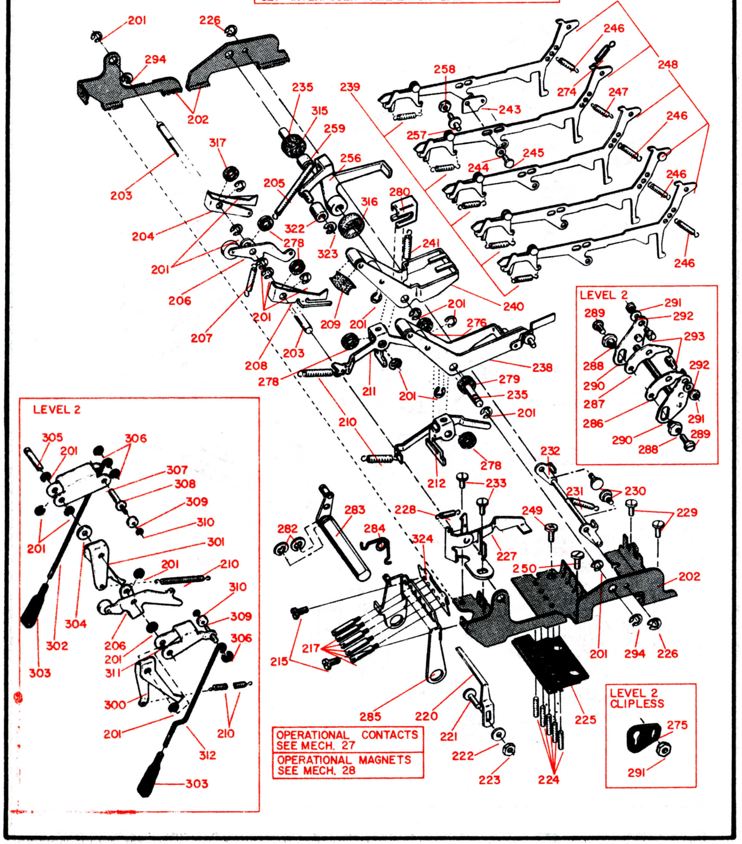
MECH. CODE
23



MECH. CODE 25

OPERATIONAL BRACKET

255- OPERATIONAL INTERPOSER BRACKET ASM. B/M
320- SPACE TO PRINT INTERLOCK B/M
321- INTERPOSER PAWL LATCH B/M



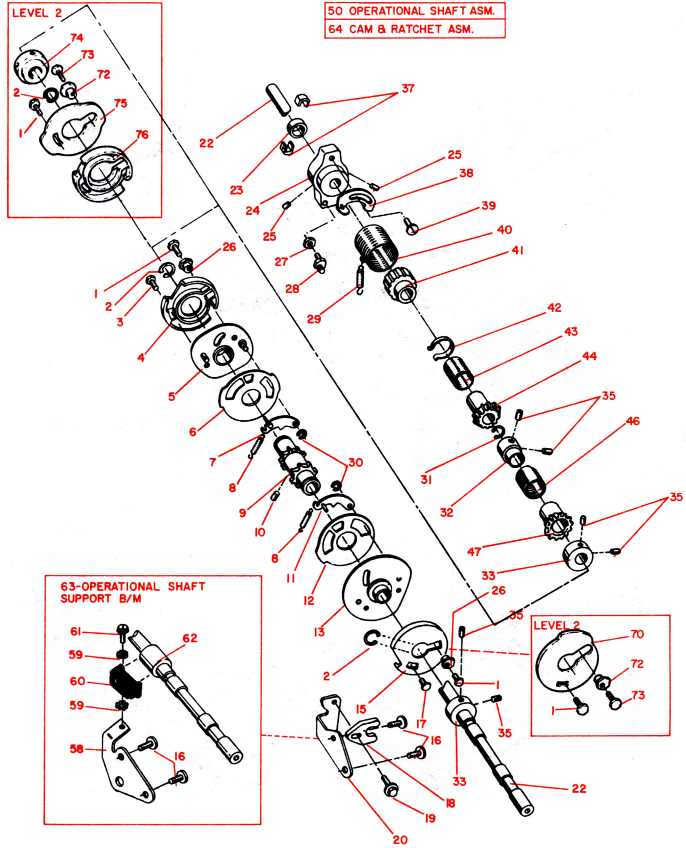
OPERATIONAL CONTACTS
SEE MECH. 27

OPERATIONAL MAGNETS
SEE MECH. 28

MECH. CODE 25

OPERATIONAL SHAFT

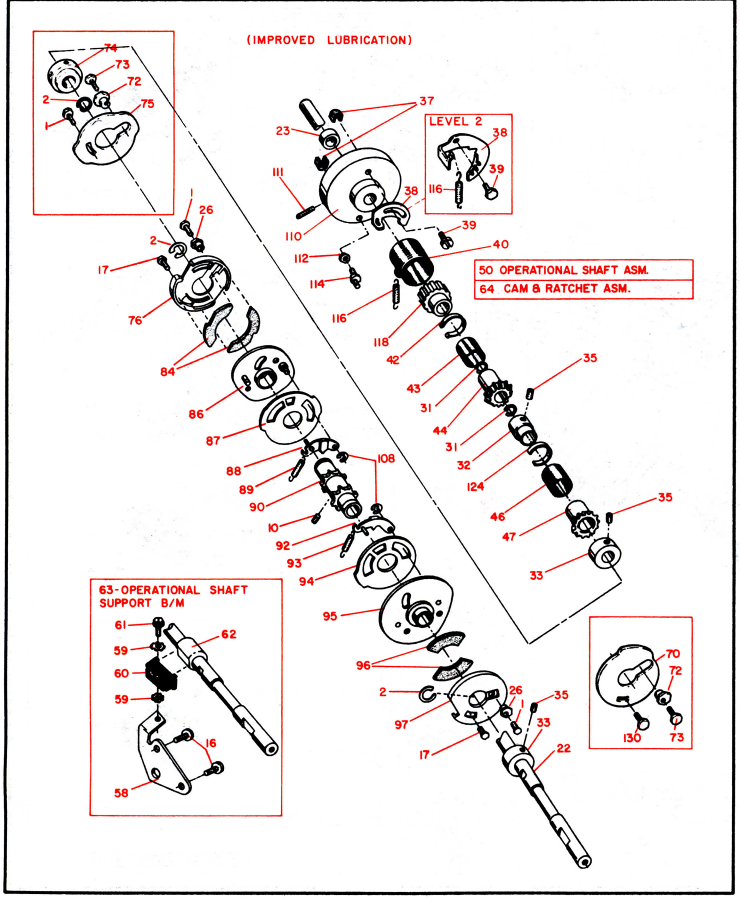
50 OPERATIONAL SHAFT ASM.
64 CAM & RATCHET ASM.



63-OPERATIONAL SHAFT
SUPPORT B/M

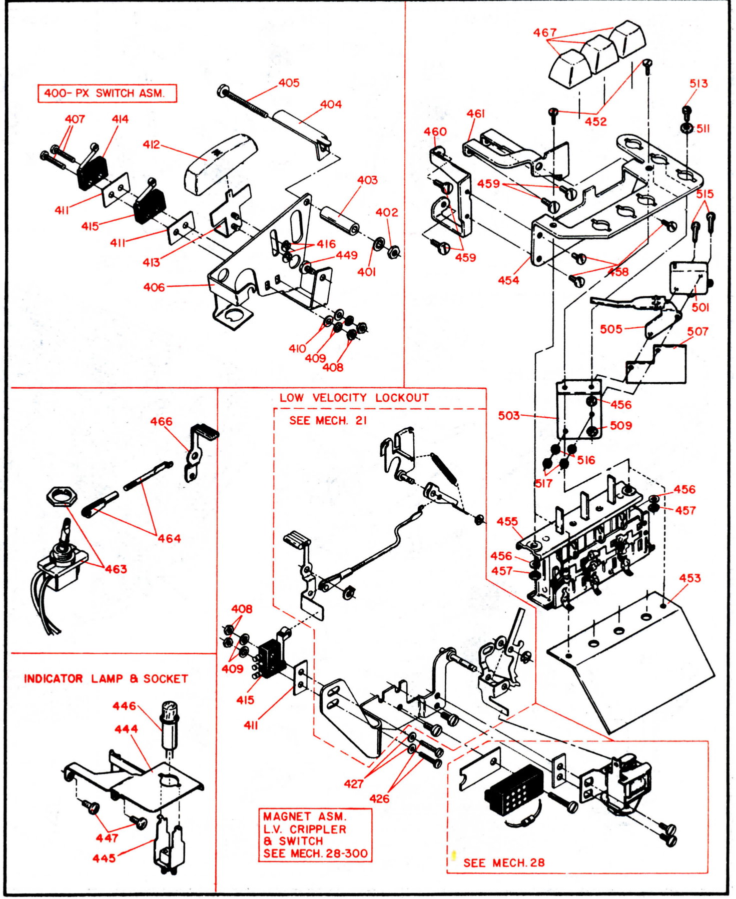
OPERATIONAL SHAFT

MECH. CODE 25



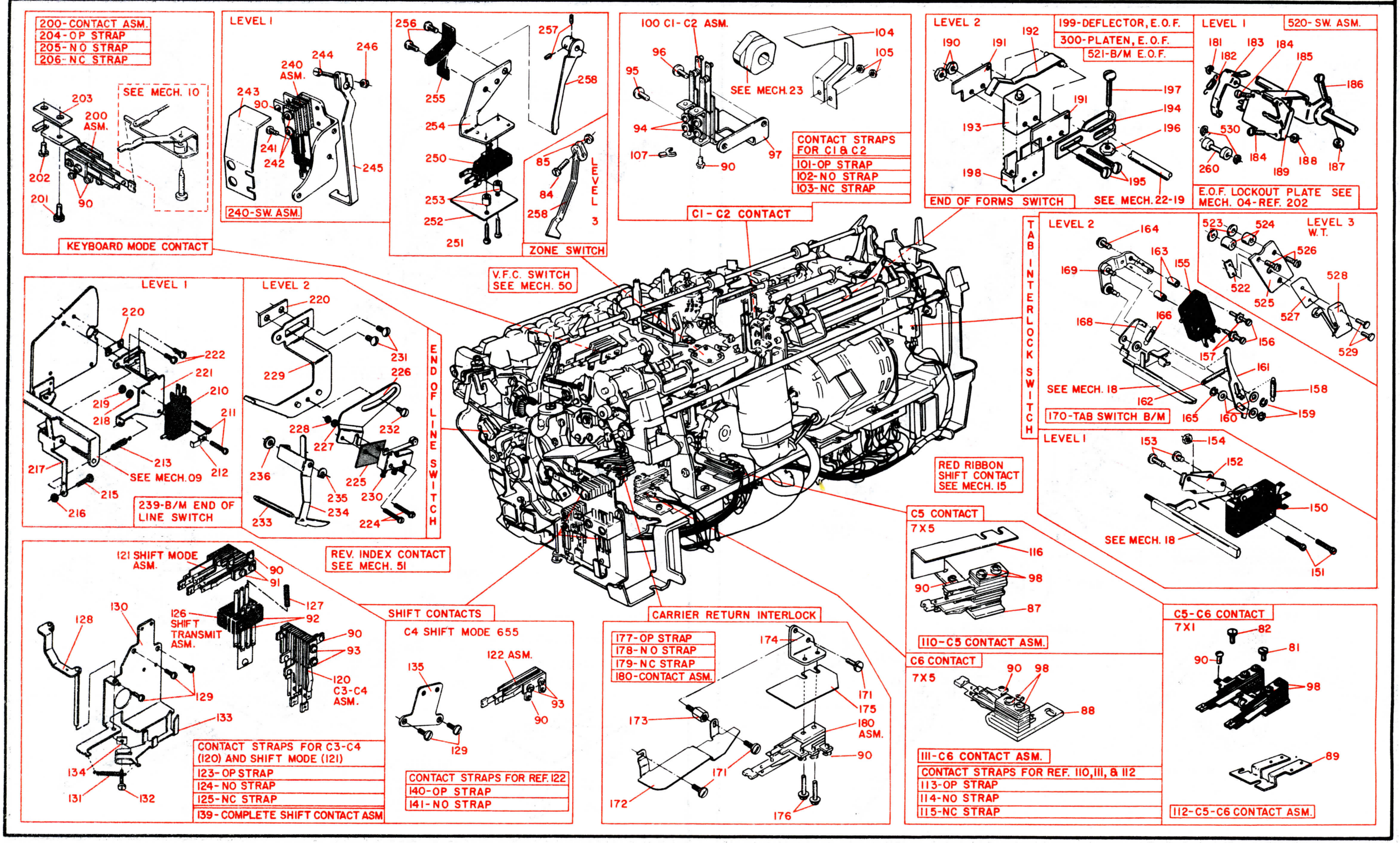
KEYBOARD CONTACTS

MECH. CODE 27



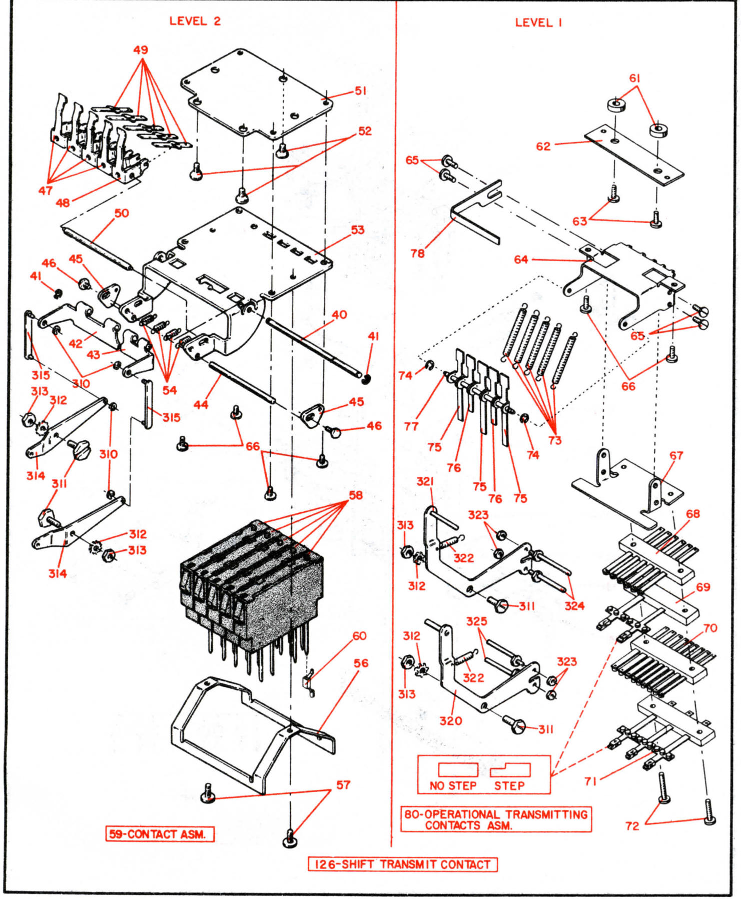
MECH. CODE
27

CONTACTS



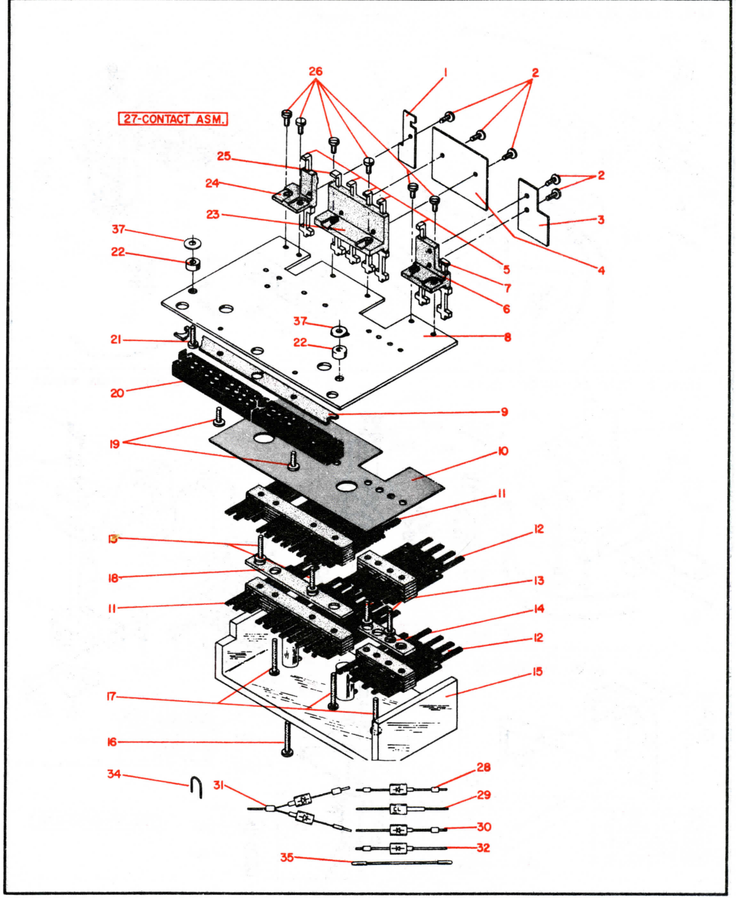
OPERATIONAL TRANSMIT CONTACTS

MECH. CODE 27



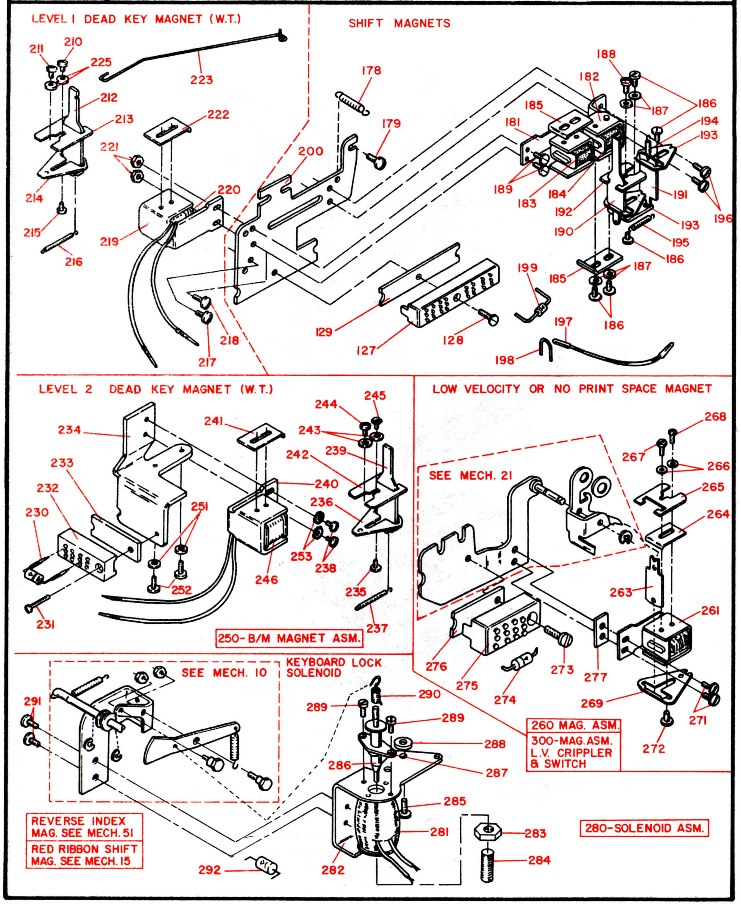
SELECTION TRANSMIT CONTACTS

MECH. CODE 27



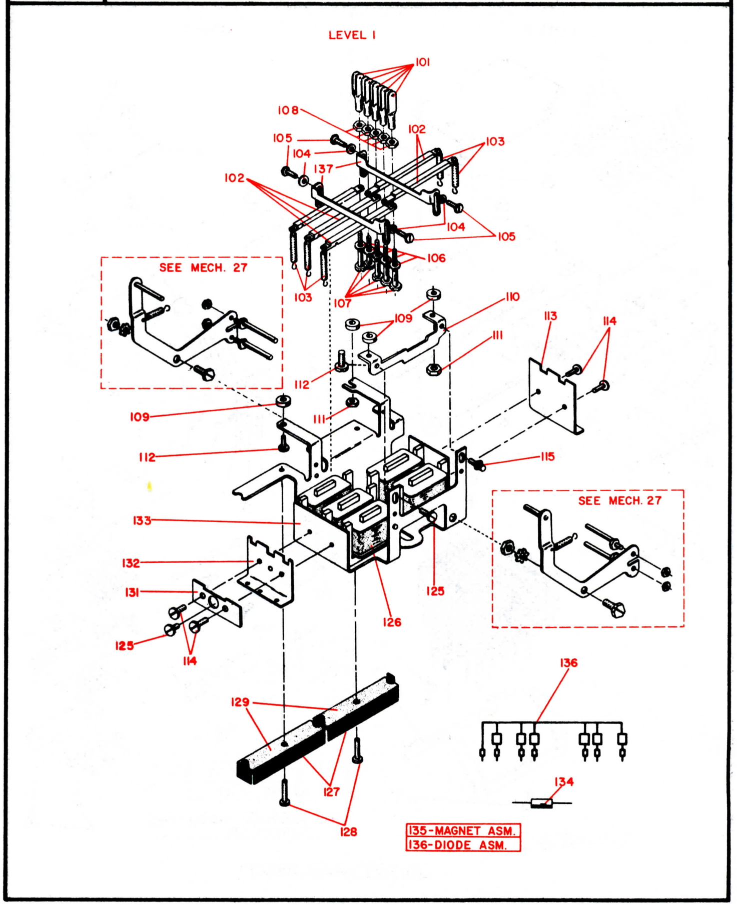
MECH. CODE
28

MAGNETS
(DK, KBD LK, LV, NP SP & SHIFT)



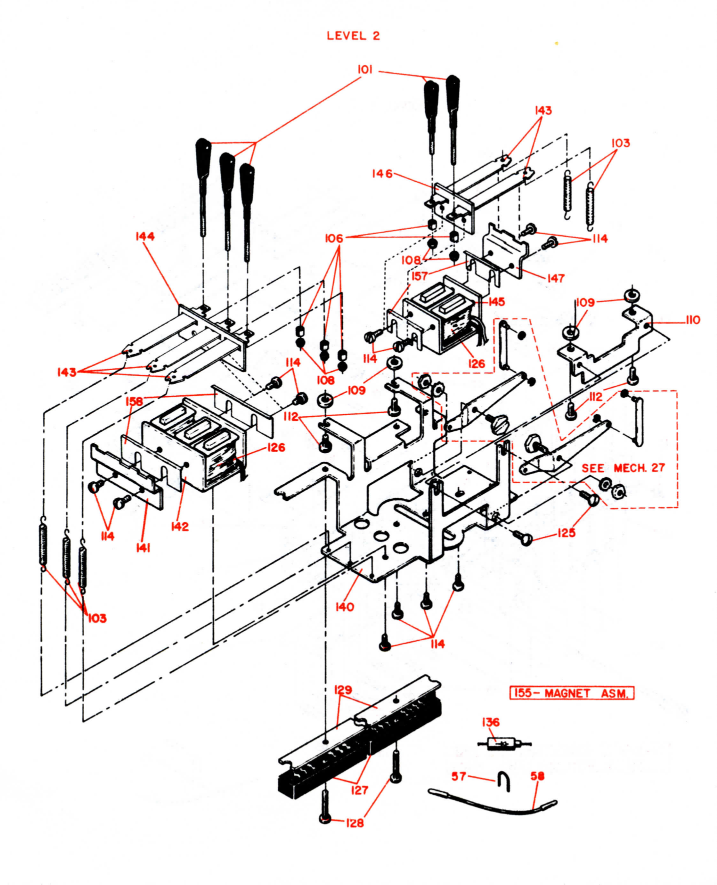
MECH. CODE
28

OPERATIONAL MAGNETS



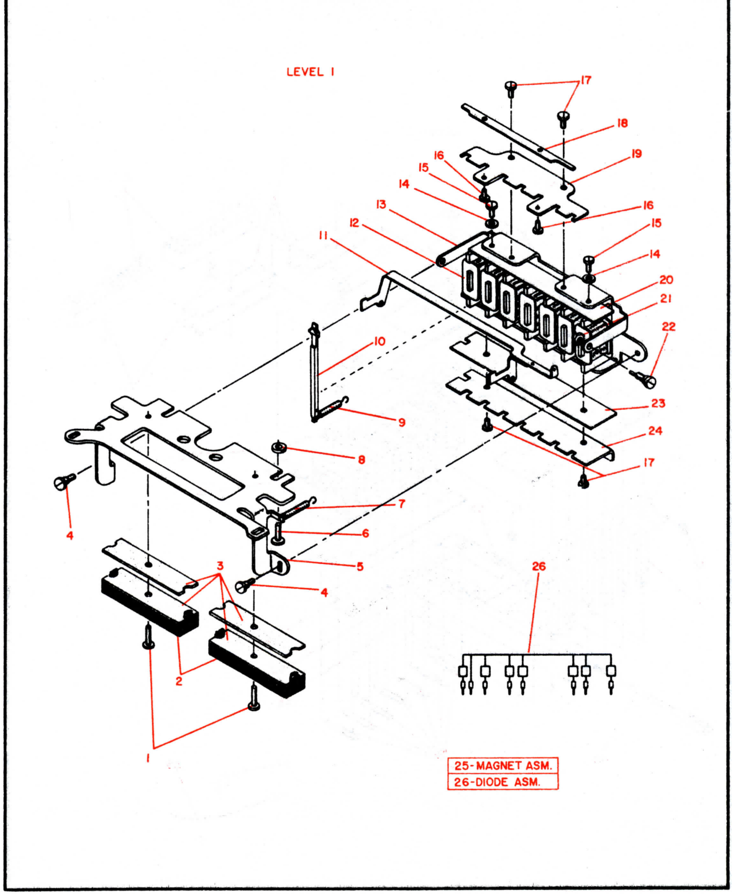
OPERATIONAL MAGNETS

MECH. CODE 28



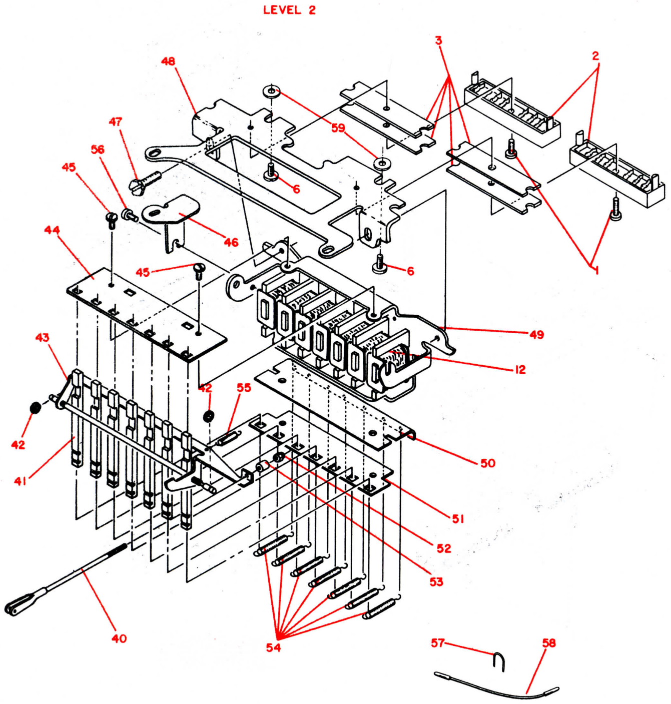
SELECTION MAGNETS

MECH. CODE 28



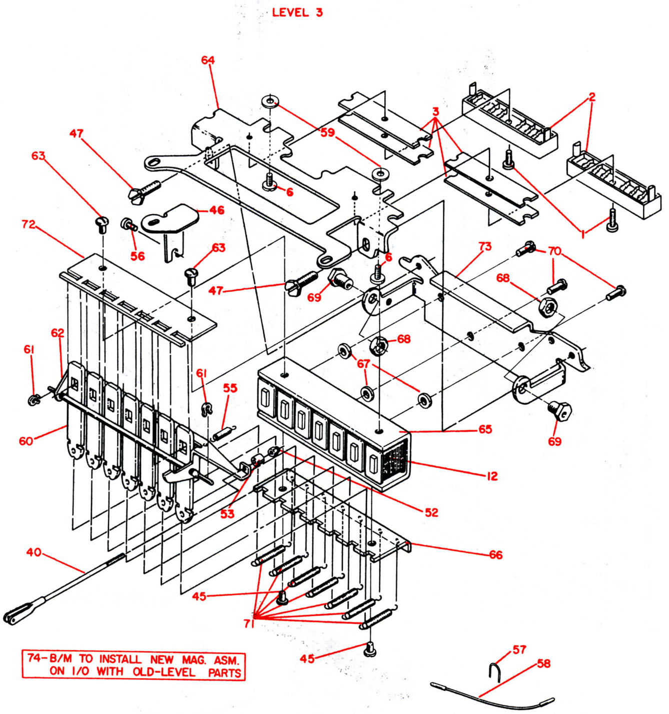
MECH. CODE
28

SELECTION MAGNETS



MECH. CODE
28

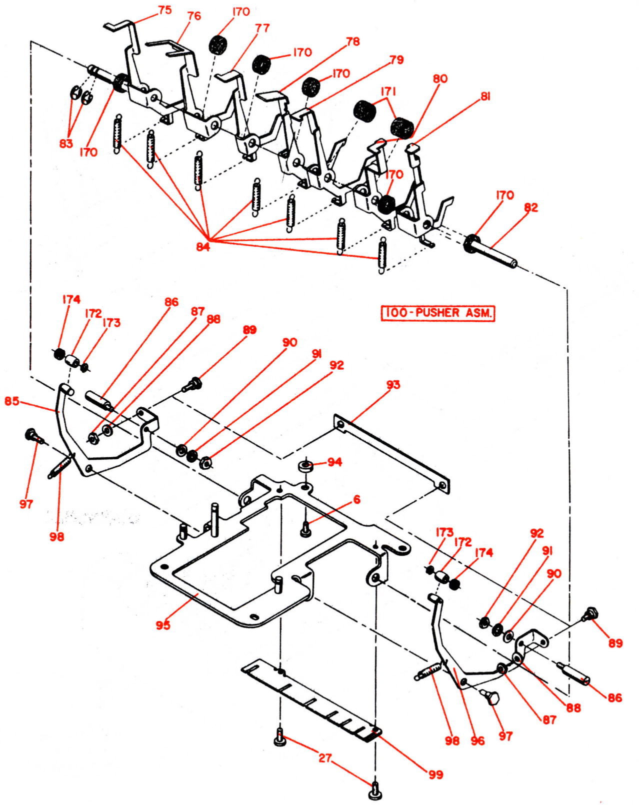
SELECTION MAGNETS



74-B/M TO INSTALL NEW MAG. ASM.
ON I/O WITH OLD-LEVEL PARTS

SELECTION LATCH PUSHERS

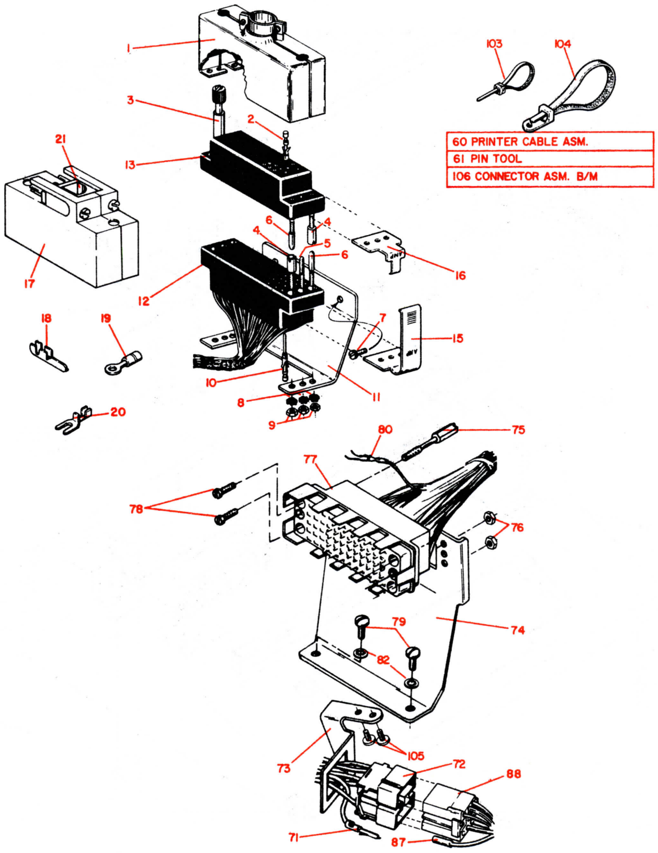
MECH. CODE
28



100-PUSHER ASM.

CABLES & CONNECTORS

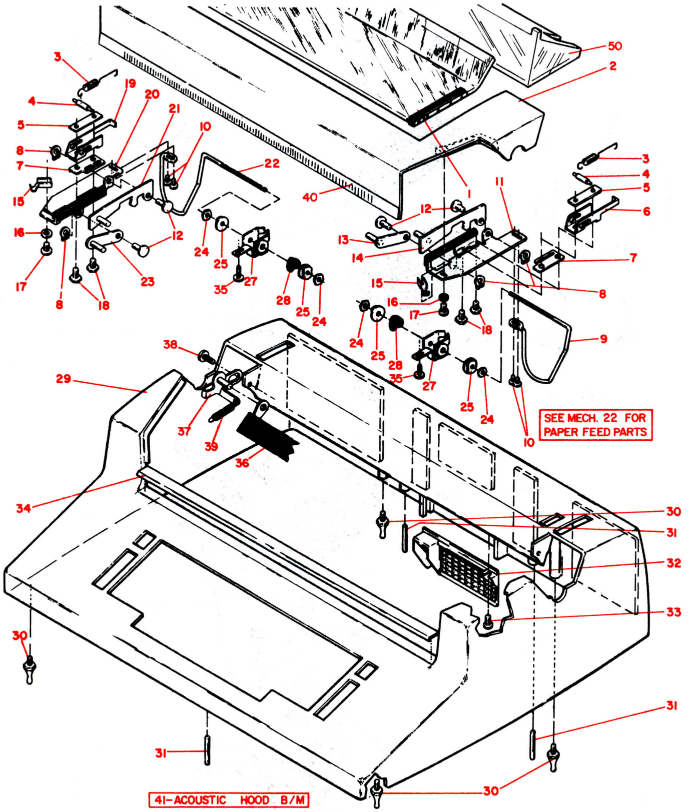
MECH. CODE
29



60 PRINTER CABLE ASM.
61 PIN TOOL
106 CONNECTOR ASM. B/M

MECH. CODE
30

ACOUSTIC HOOD

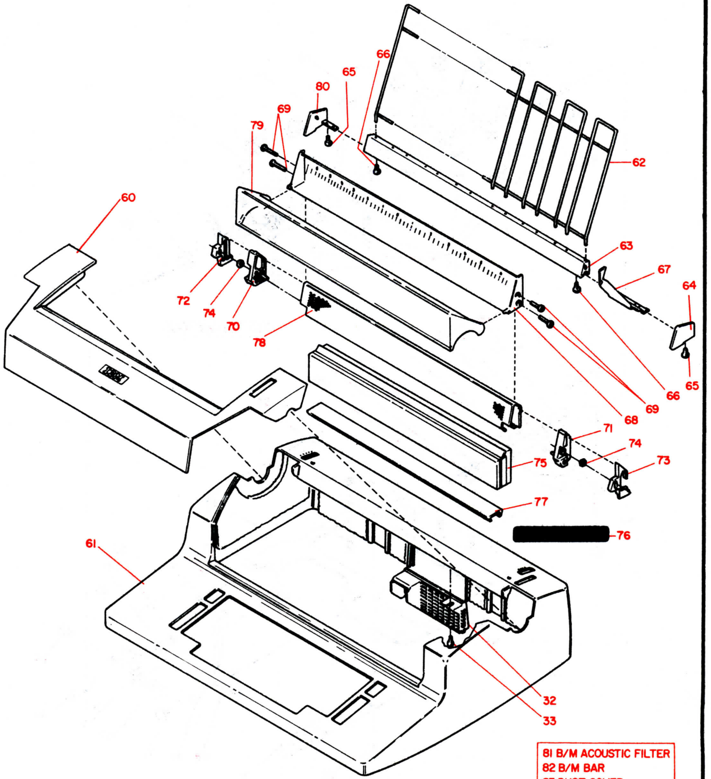


SEE MECH. 22 FOR PAPER FEED PARTS

41-ACOUSTIC HOOD B/M

MECH. CODE
30

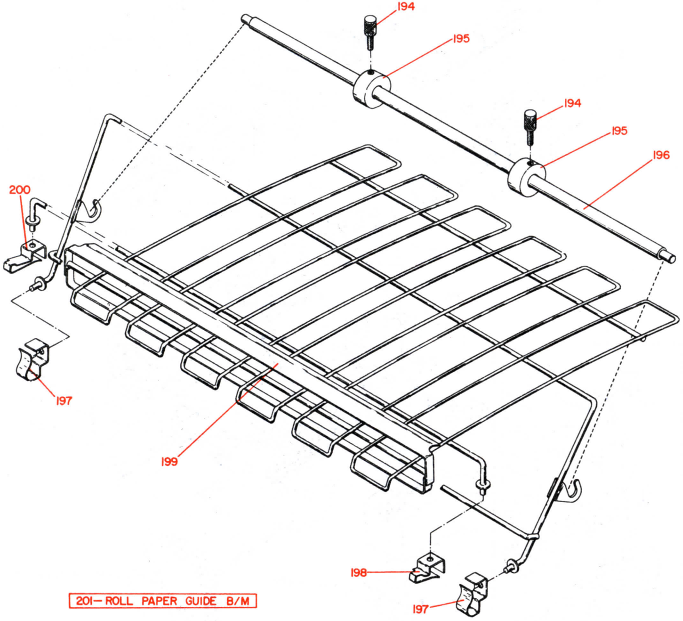
ACOUSTIC HOOD



81 B/M ACOUSTIC FILTER
82 B/M BAR
83 DUST COVER

ROLL PAPER HOLDER

MECH. CODE 40



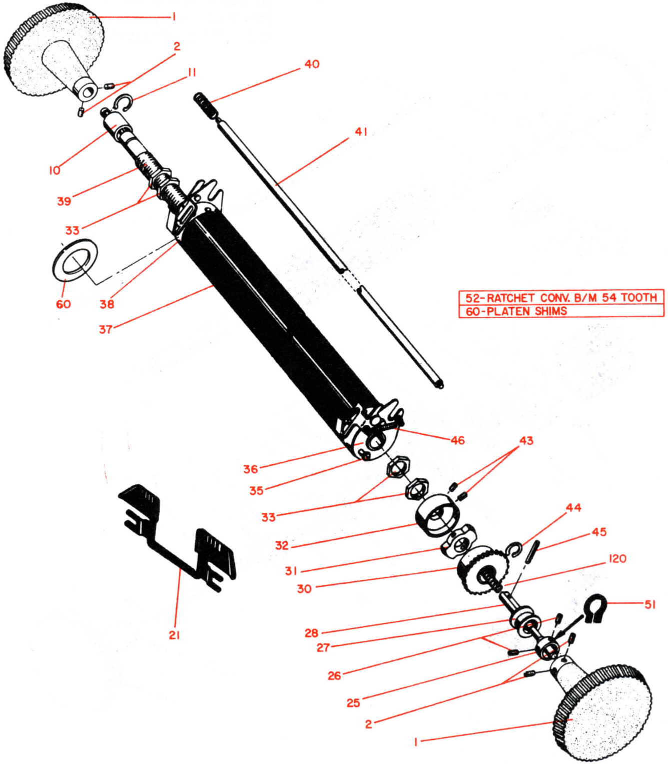
201– ROLL PAPER GUIDE B/M

15" MACHINES ONLY

PIN FEED PLATEN

MECH. CODE 49

LEVEL I



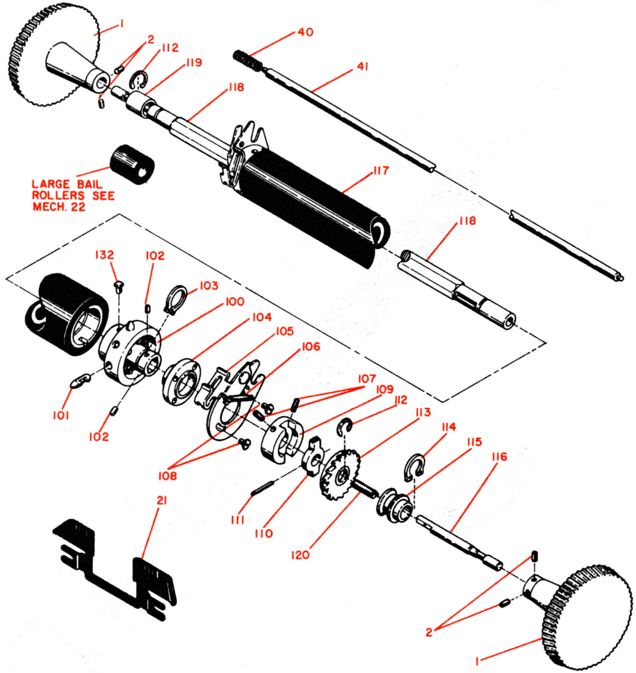
52-RATCHET CONV. B/M 54 TOOTH
60-PLATEN SHIMS

MECH. CODE **49**

PIN FEED PLATEN

LEVEL 2

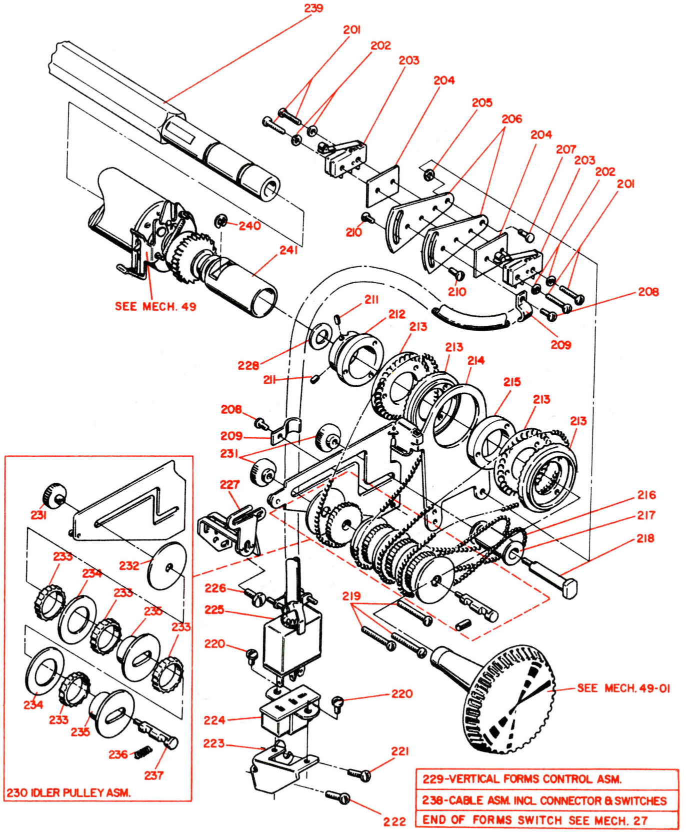
130 PINWHEEL ASM.
131 PINFEED PLATEN B/M
ORDER CORE, KNOBS, AND CARD HOLDER SEPARATELY



LARGE BAIL ROLLERS SEE MECH. 22

MECH. CODE **50**

VERTICAL FORMS CONTROL



SEE MECH. 49

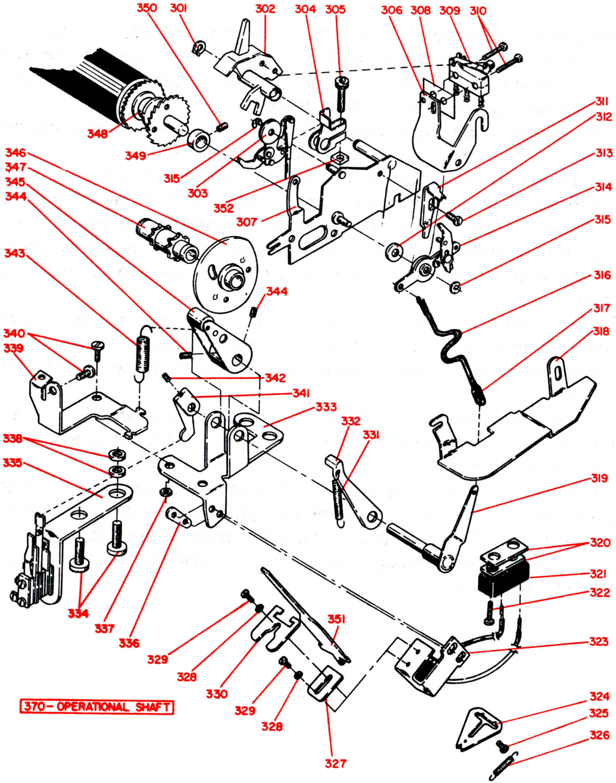
SEE MECH. 49-01

230 IDLER PULLEY ASM.

229-VERTICAL FORMS CONTROL ASM.
238-CABLE ASM. INCL CONNECTOR & SWITCHES
END OF FORMS SWITCH SEE MECH. 27

REVERSE INDEX

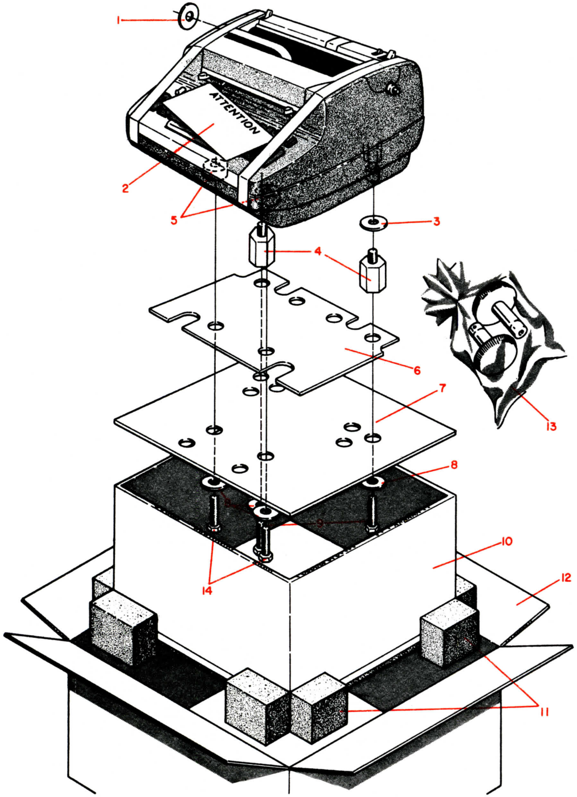
MECH. CODE 51



MECH. CODE

MECH. CODE
65

PACKING PARTS



MECH. CODE
65

PACKING INSTRUCTIONS

A. Remove top cover and tilt machine up. Insert (2) spacer legs in (2) front cutouts of sound deadening material; position over holes in bottom cover. Screw (2) leg extensions with washers into rear legs. Reposition machine and replace top cover.

B. Move carrier mechanism to extreme left; depress tab torque bar and while holding carrier, tape into position as shown.

C. For machines equipped with carbon ribbon attachment, clean underside of carrier. Move carrier to extreme left; take a piece of tape about 8 inches long and tape on the underside of the carrier to the front as close to the print shaft as possible; while depressing tab button, pull carrier to extreme left and fasten tape to the top front cover.

D. On Std platen machines, remove platen and place platen retainer over left hand platen, flush against end of platen. Replace and secure platen in normal position. Close top cover and tape to bottom cover.

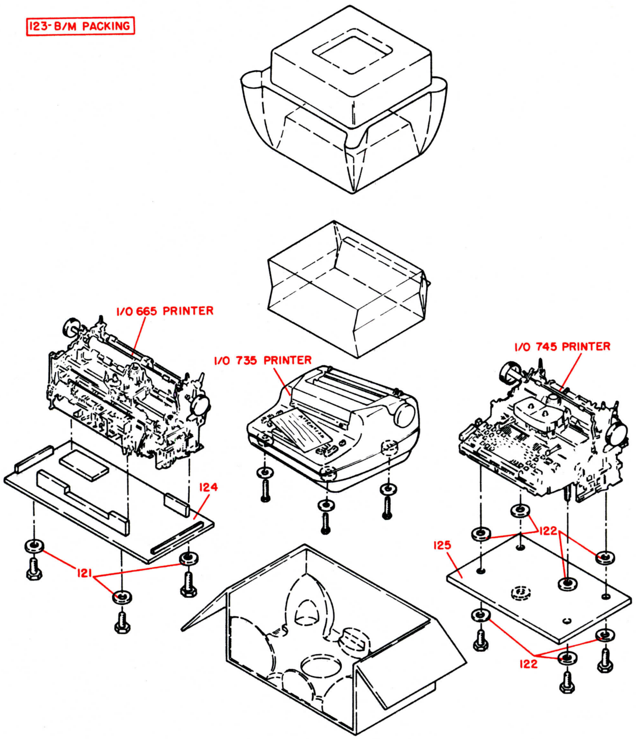
E. On machines with sound deadening feature, tape acrylic shield in the center of machine to rear of top cover. Tape both sides to right and left of top cover.

F. Tilt machine to rear so bottom of machine is accessible. Fasten pallets small and large to machine using hex head bolts and washers.

G. Tape bottom of carton; place two foam pads in bottom. Place two platen knobs in polybag and place in bottom. Place palletized machine in carton.

W.T. PACKING PARTS

MECH. CODE 65



W.T. PACKING INSTRUCTIONS

MECH. CODE 65

A. Remove center cover and place machine in tilt-up position.
Select 4 spaces for correct height (see spacer table).
When machine is tilted down, machine must just rest on spacers.

B. Move machine down and place shipping spacers and shipping screws.

C. Place machine in polybag.

D. Place machine in carton, positioned so it rests on foam ring centered in carton.

E. Place accessory group at left end of machine; fold top of polybag and secure bag with tape.

F. Insert top cushion in carton.

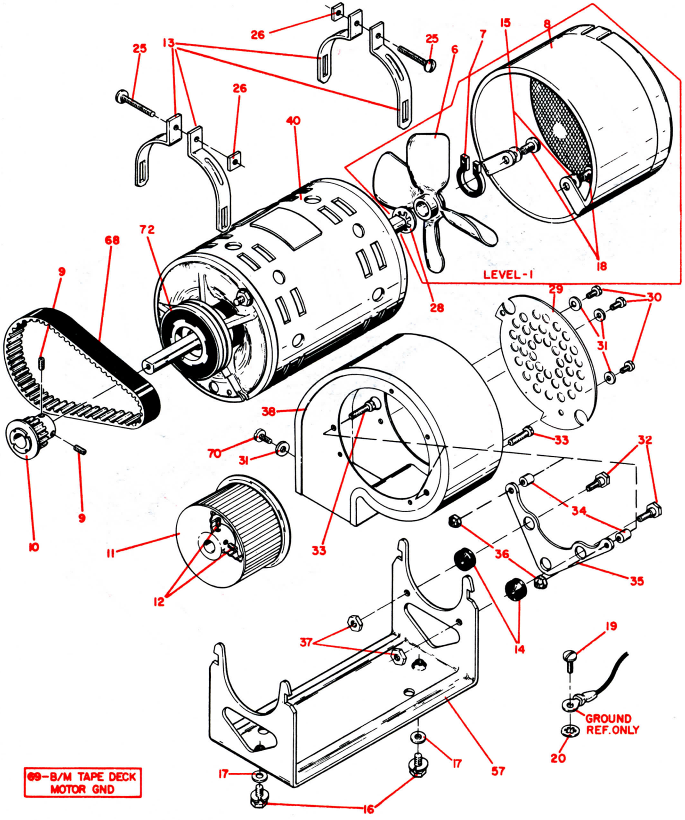
G. Close carton and tape.

SPACER TABLE

Height in mm	Part No.	Color
14,2	8174073	Blue
15,5	8174074	Yellow
18,2	8174075	White
18,7	8174076	Grey

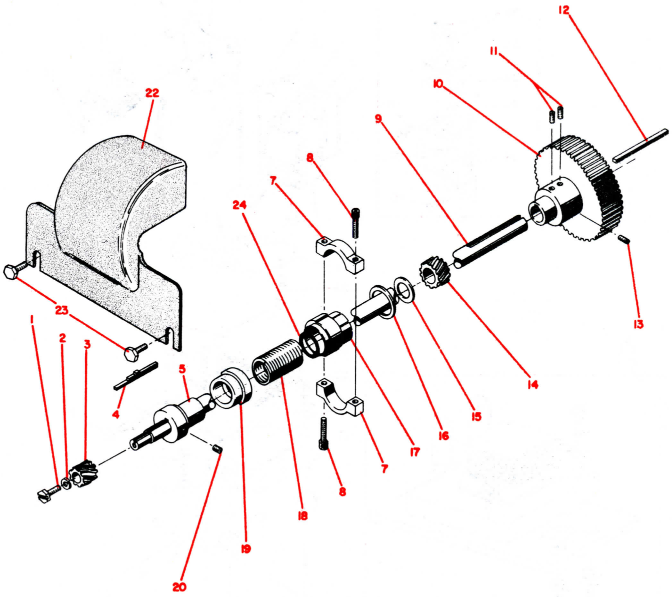
MOTOR & FAN

MECH. CODE
66



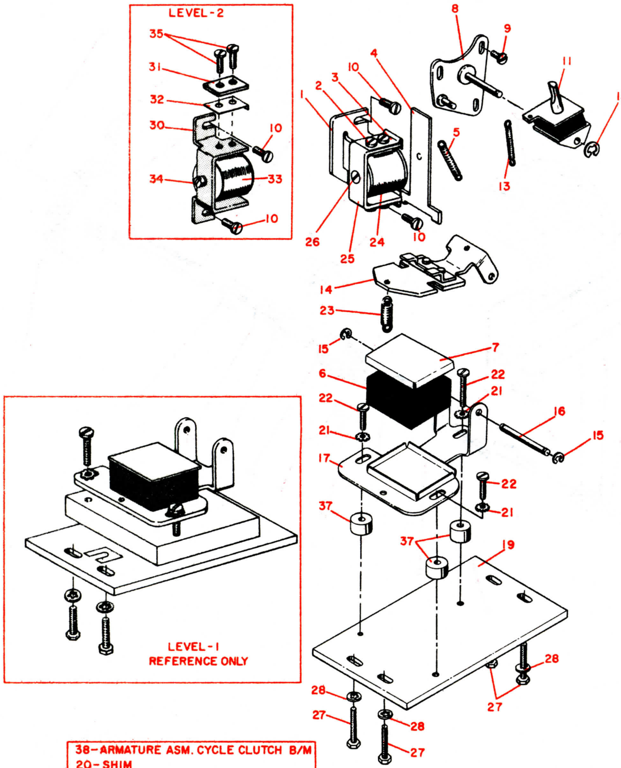
DRIVE SHAFT & CYCLE CLUTCH

MECH. CODE
67



MECH. CODE
68

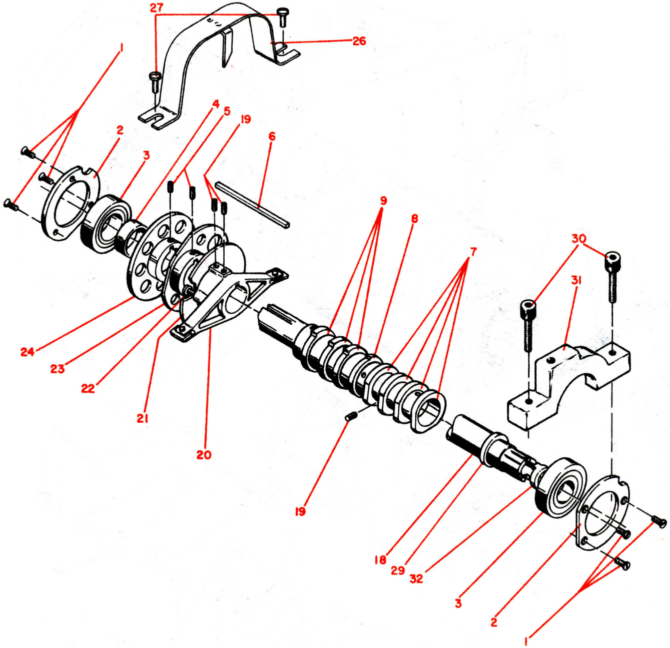
CYCLE CLUTCH MAGNET & DETENT



38-ARMATURE ASM. CYCLE CLUTCH B/M
20-SHIM
36-CYCLE CLUTCH ARM BASE B/M

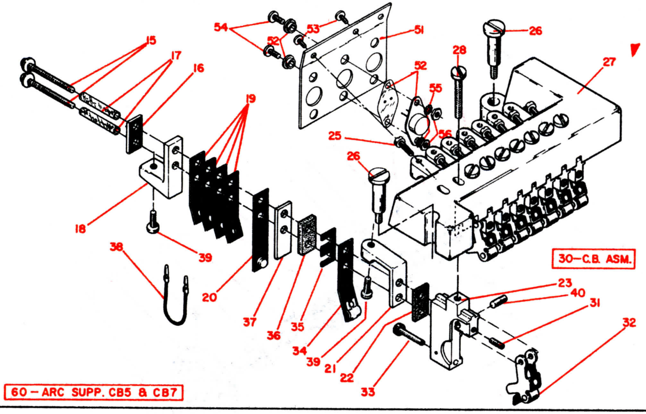
MECH. CODE
69

DRIVE SLEEVE



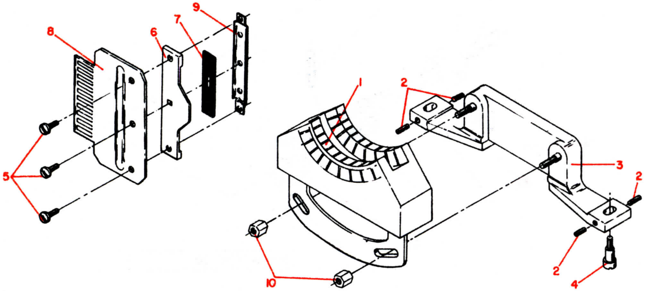
EMITTER & C.B.'s

MECH. CODE 70



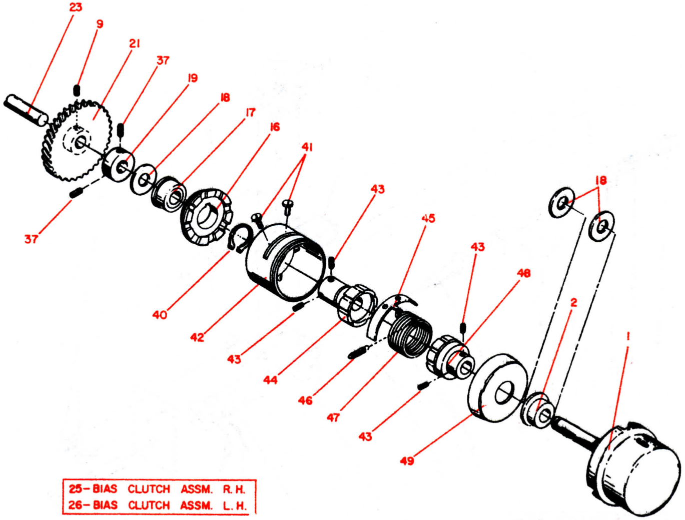
30—C.B. ASM.

60 — ARC SUPP. CB5 & CB7



REWIND SHAFT

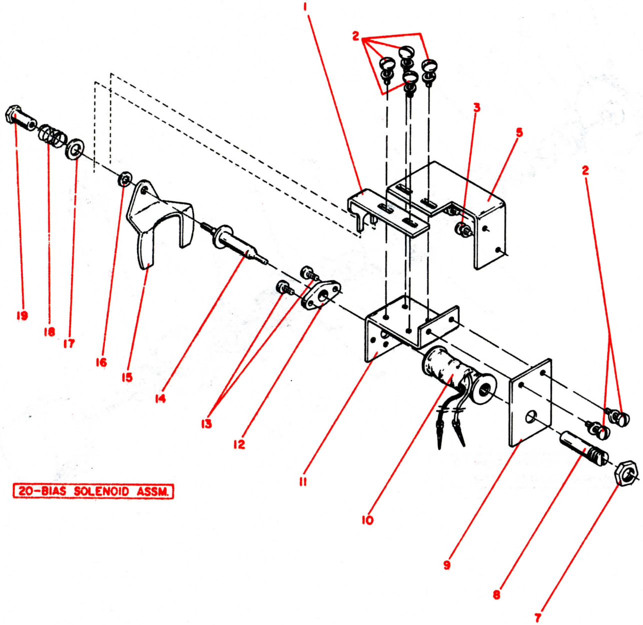
MECH. CODE 71



25– BIAS CLUTCH ASSM. R.H.
26– BIAS CLUTCH ASSM. L.H.

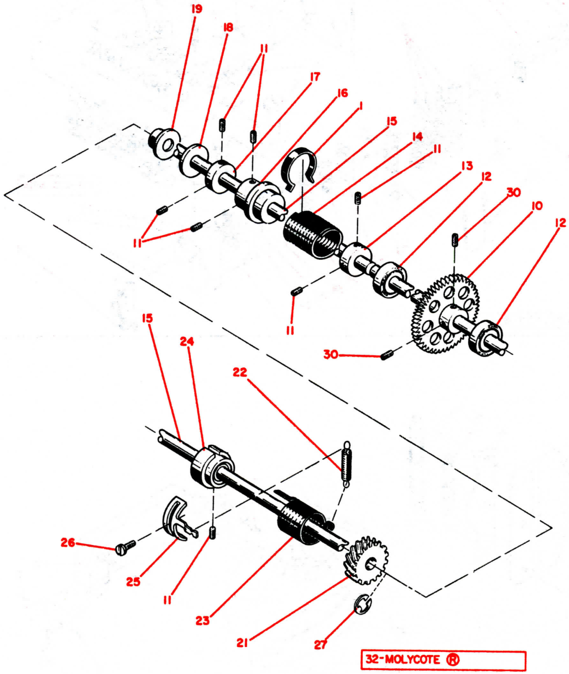
MECH. CODE
72

BIAS SOLENOID



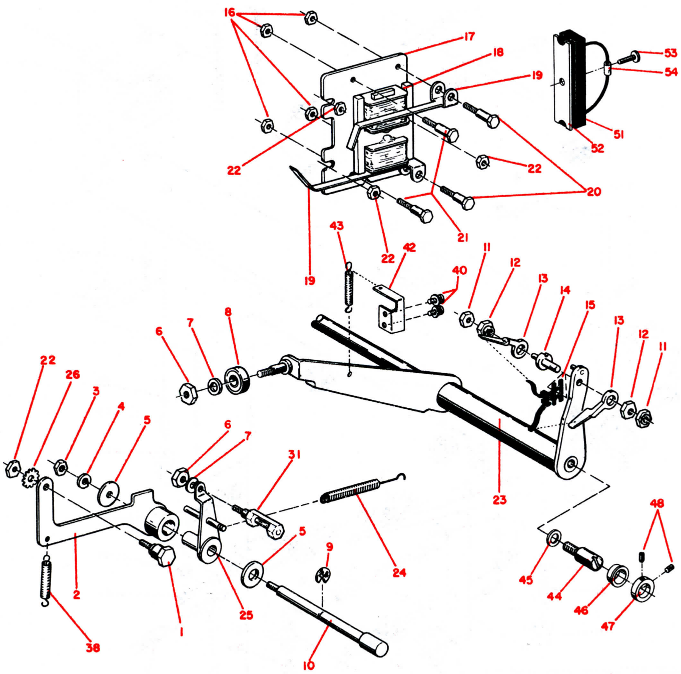
MECH. CODE
73

TORQUE LIMITER SHAFT



STEPPING MECHANISM

MECH. CODE 74



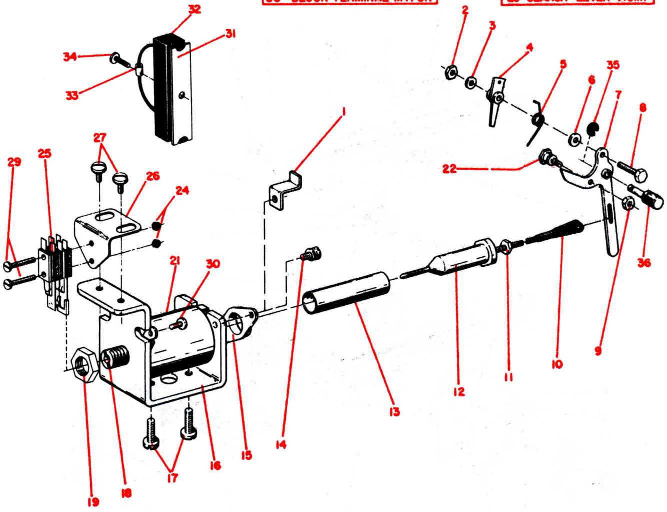
55—DETENT LEVER STUD REPLACEMENT B/M
60—MAGNET ASM.,STEPPING

DETENT SOLENOID & LEVERS

MECH. CODE 76

50-BLOCK TERMINAL MT/SR

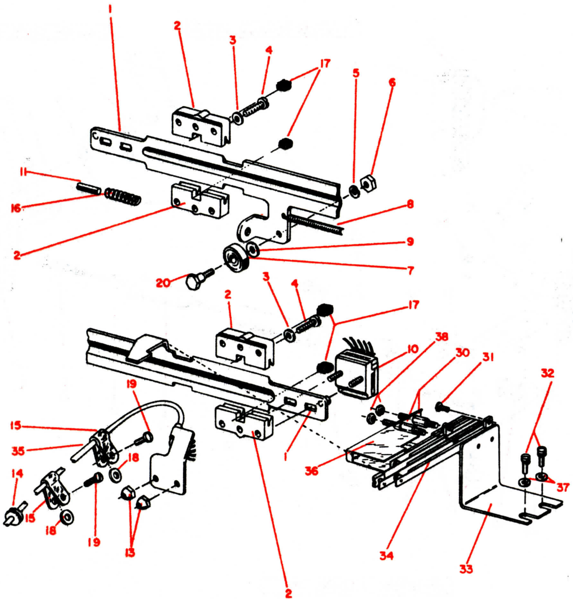
23-SEARCH LEVER ASM.



37-DETENT SOLENOID ASM.

MECH. CODE
77

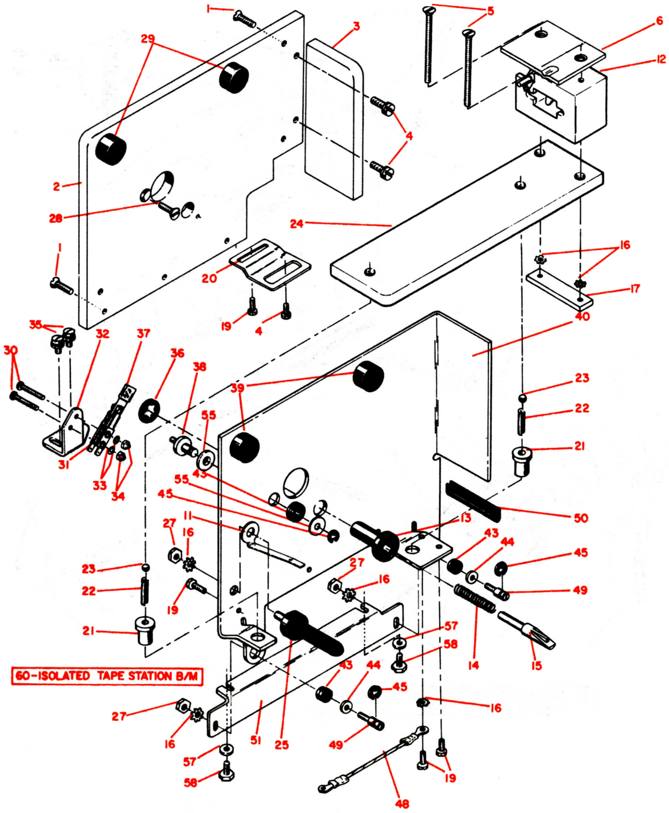
HEAD & SLIDE



40-TAPE DEVELOPER

MECH. CODE
78

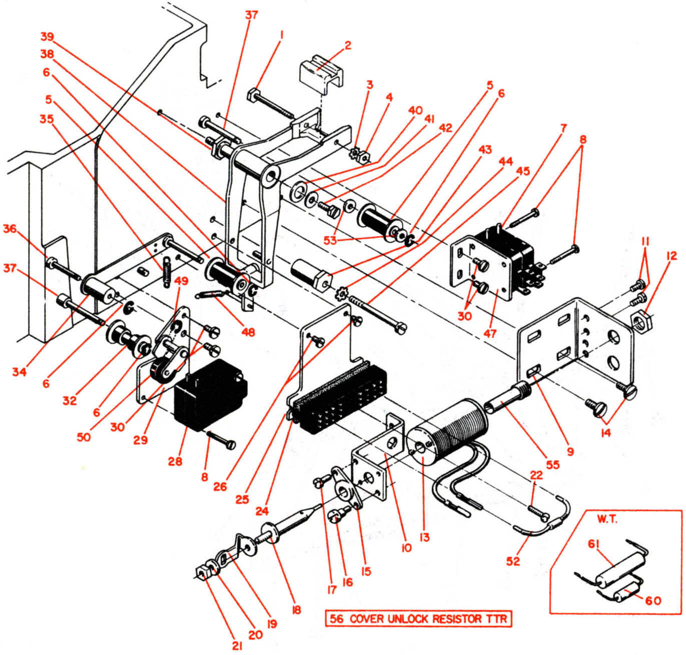
STATION PLATFORM



60-ISOLATED TAPE STATION B/M

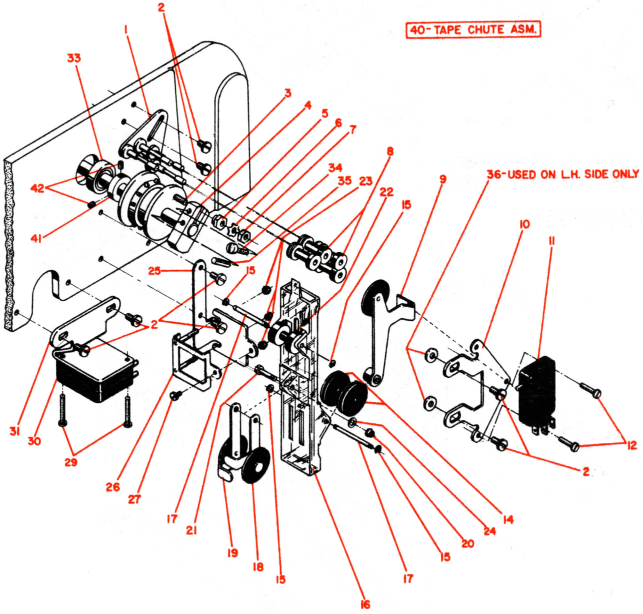
TAPE PATH SUPPORT & GUIDE

MECH. CODE
79



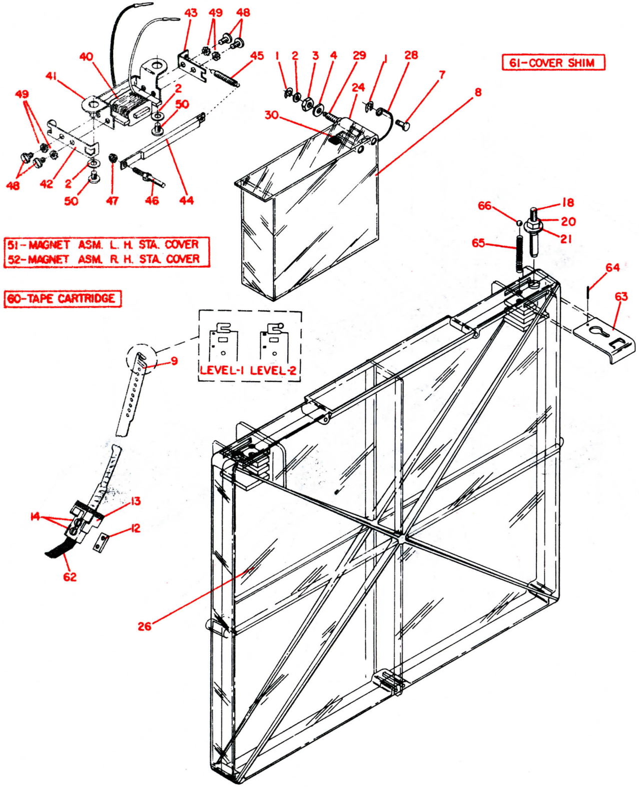
TAPE PATH DRIVE

MECH. CODE
80



MECH. CODE
81

TAPE BIN



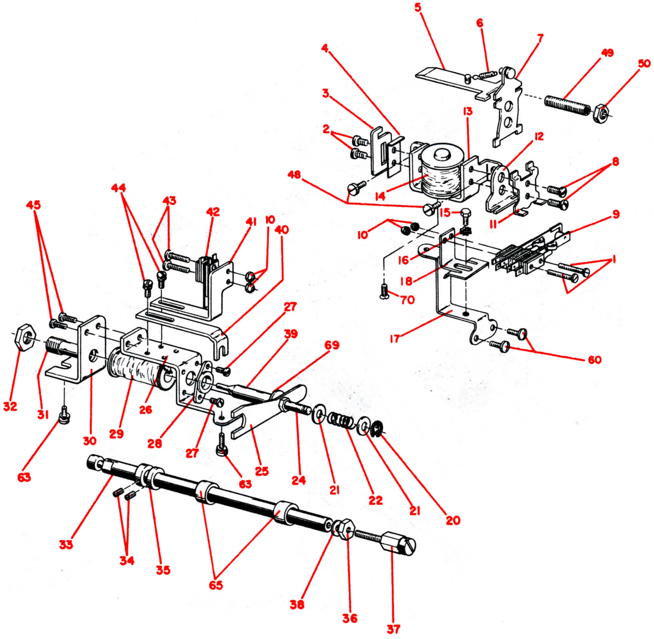
61-COVER SHIM

51-MAGNET ASM. L. H. STA. COVER
52-MAGNET ASM. R. H. STA. COVER

60-TAPE CARTRIDGE

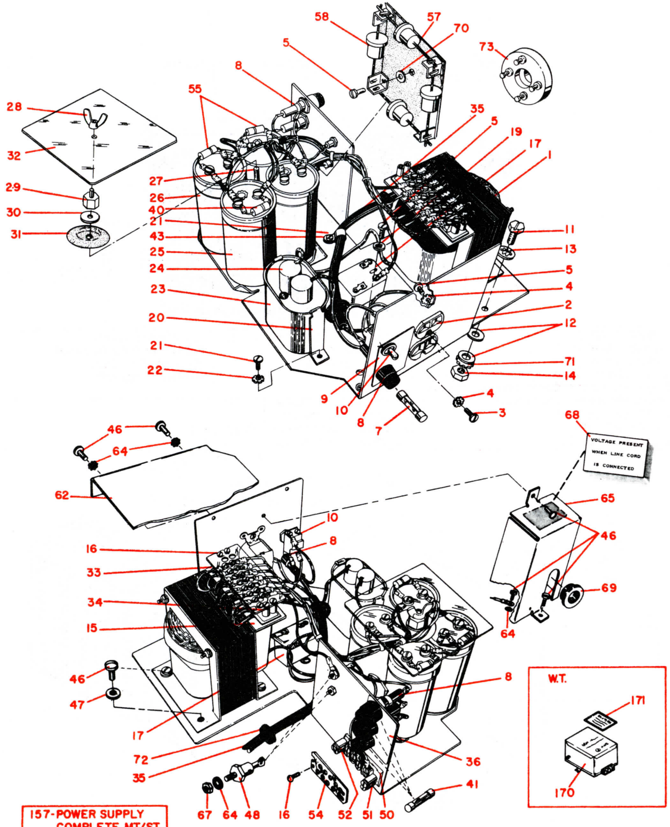
MECH. CODE
82

SEARCH SOLENOID & MAGNET



POWER SUPPLY

MECH. CODE
83

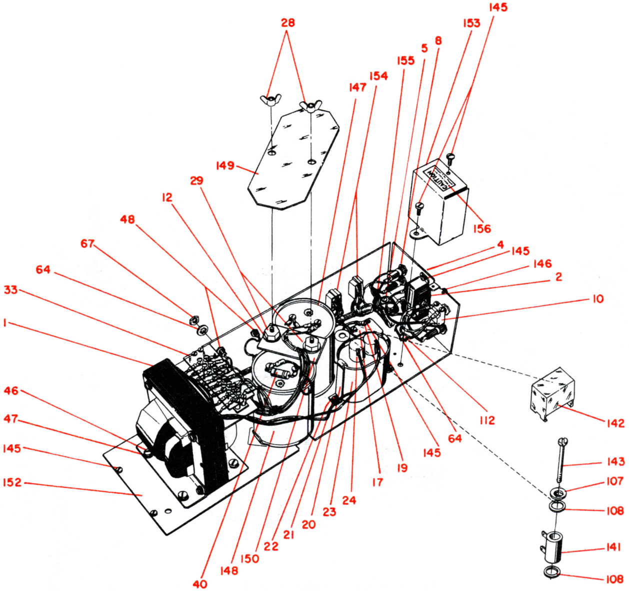


157-POWER SUPPLY COMPLETE MT/ST

180-B/M PCB FREE CAPACITOR

POWER SUPPLY

MECH. CODE
83

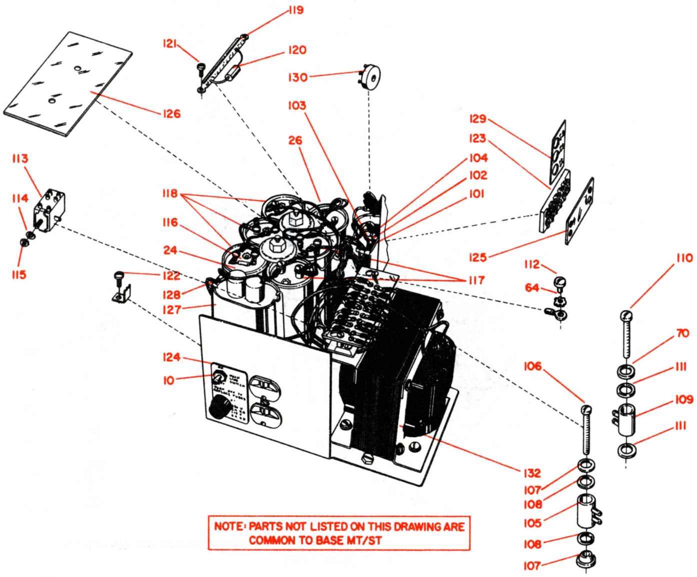


NOTE: PARTS NOT LISTED ON THIS DRAWING ARE COMMON TO BASE MT/ST

158 POWER SUPPLY COMPLETE MT/SR

MECH. CODE
83

POWER SUPPLY

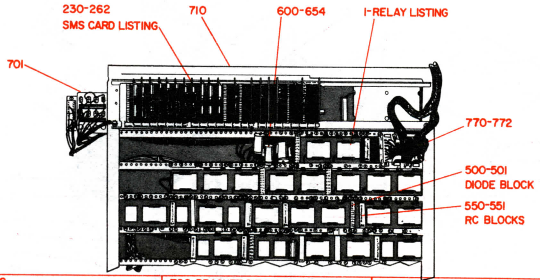


NOTE: PARTS NOT LISTED ON THIS DRAWING ARE COMMON TO BASE MT/ST

158 POWER SUPPLY COMPLETE MT/SR

MECH. CODE
84

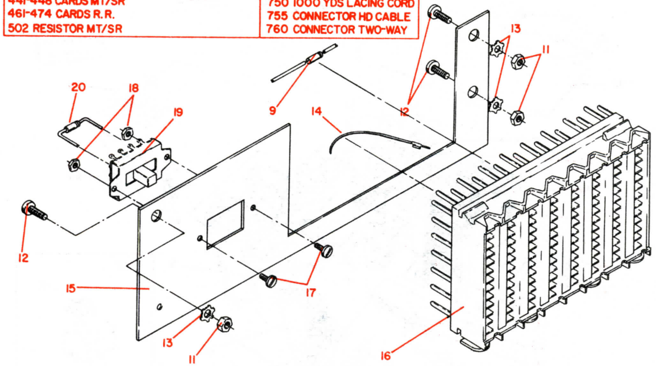
RELAYS & ELECTRONICS



2 CONTACT WIRES
3 12 POS DUMMY PLUG
4 TEST LIGHT BULB
100 B/M IMPROVED CODE CONVERSION (CE M 68)
101 B/M HOT KEYBOARD WIRING CHANGE (CE M 74)
102 B/M ARC SUPPRESSION (CE M 153)
441-448 CARDS MT/SR
461-474 CARDS R.R.
502 RESISTOR MT/SR

702 BRACKET BIT LIGHT NEW STYLE
725 BLUE JUMPER
735 BRASS JUMPERS
739 SPAGHETTI
740 TAPER PINS
745 100' ROLL OF YELLOW
750 1000 YDS LACING CORD
755 CONNECTOR HD CABLE
760 CONNECTOR TWO-WAY

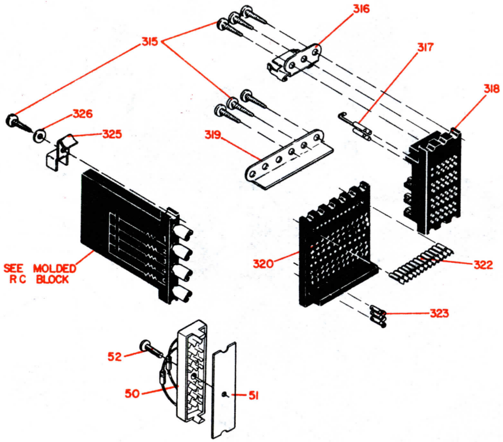
773 TERMINAL BLOCK
800 DIAGRAMS RELAY WIRING
851 MONITOR COVER
852-858 MONITOR



10-SWITCH B/M

RELAYS & ELECTRONICS

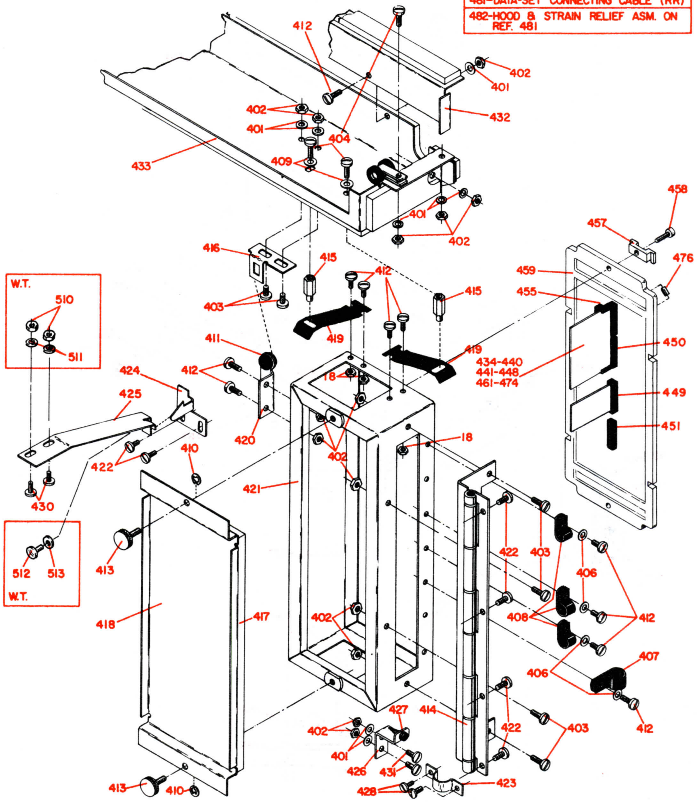
MECH. CODE
84



852-858 B/M MAINTENANCE MONITOR

SLD ELECTRONIC GATES

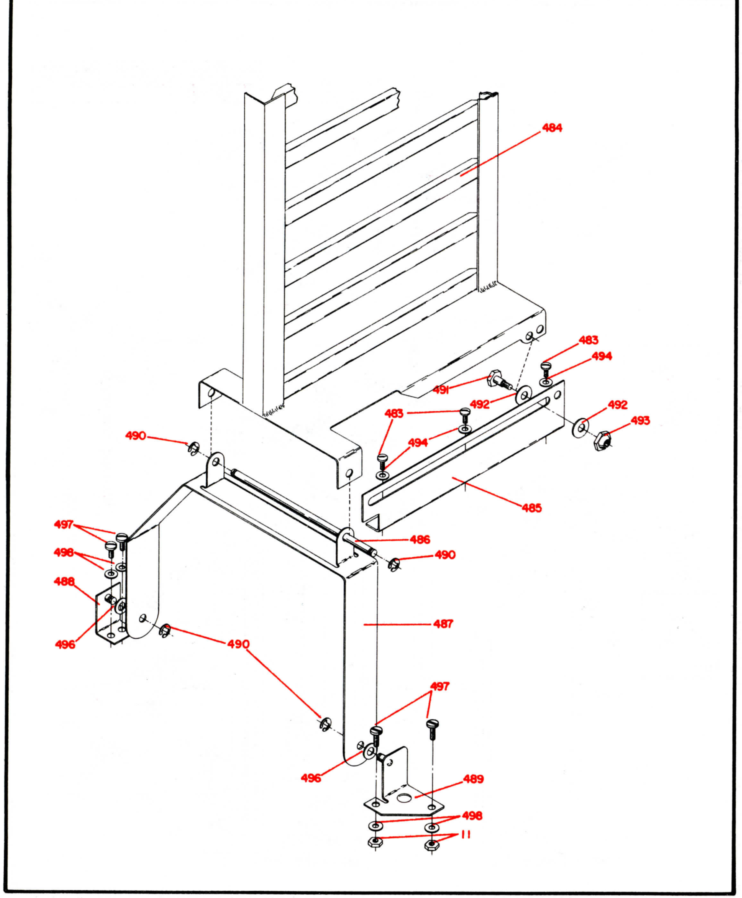
MECH. CODE
84



481-DATA-SET CONNECTING CABLE (RR)
482-HOOD & STRAIN RELIEF ASM. ON REF. 481

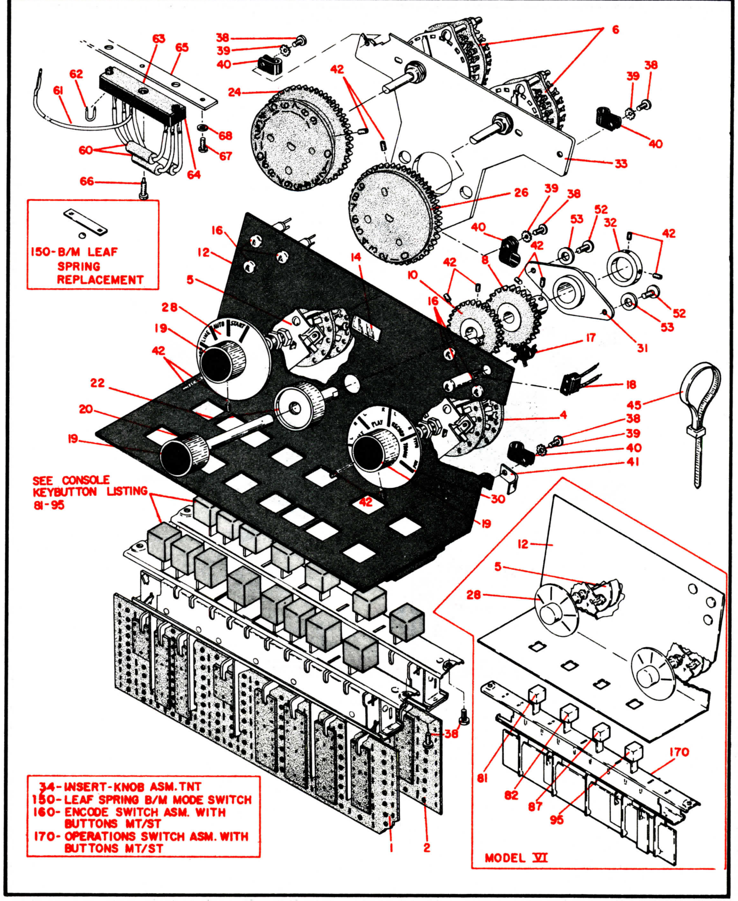
MECH. CODE
84

AUXILIARY RELAY GATE



MECH. CODE
86

CONTROL PANEL & SWITCHES



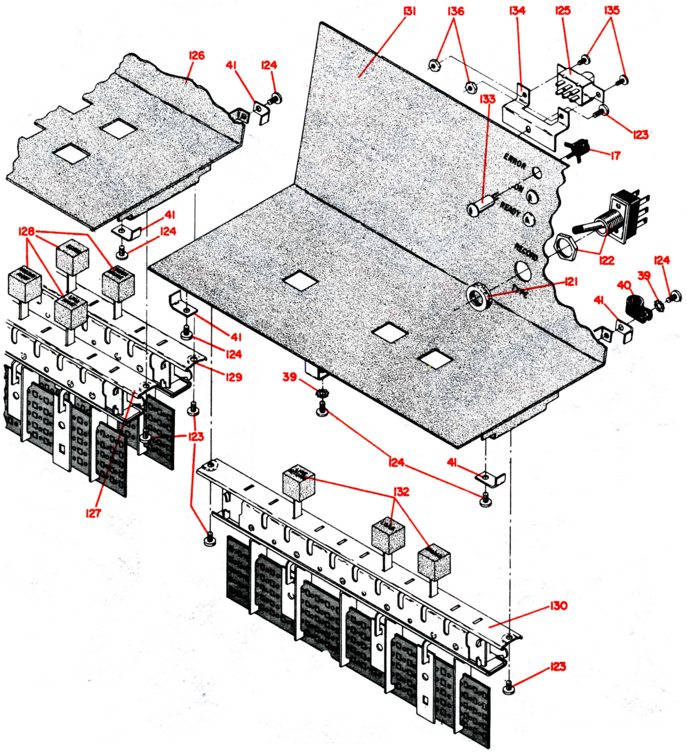
150-B/M LEAF SPRING REPLACEMENT

SEE CONSOLE KEYBUTTON LISTING 81-95

34- INSERT-KNOB ASM. TNT
150- LEAF SPRING B/M MODE SWITCH
160- ENCODE SWITCH ASM. WITH BUTTONS MT/ST
170- OPERATIONS SWITCH ASM. WITH BUTTONS MT/ST

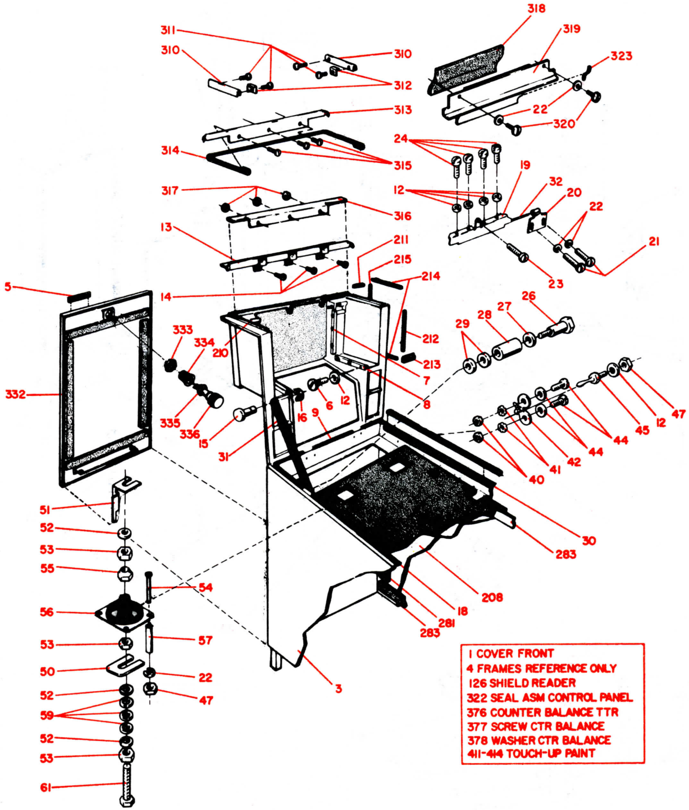
CONTROL PANEL & SWITCHES

MECH. CODE
86



COVERS & MOUNTING

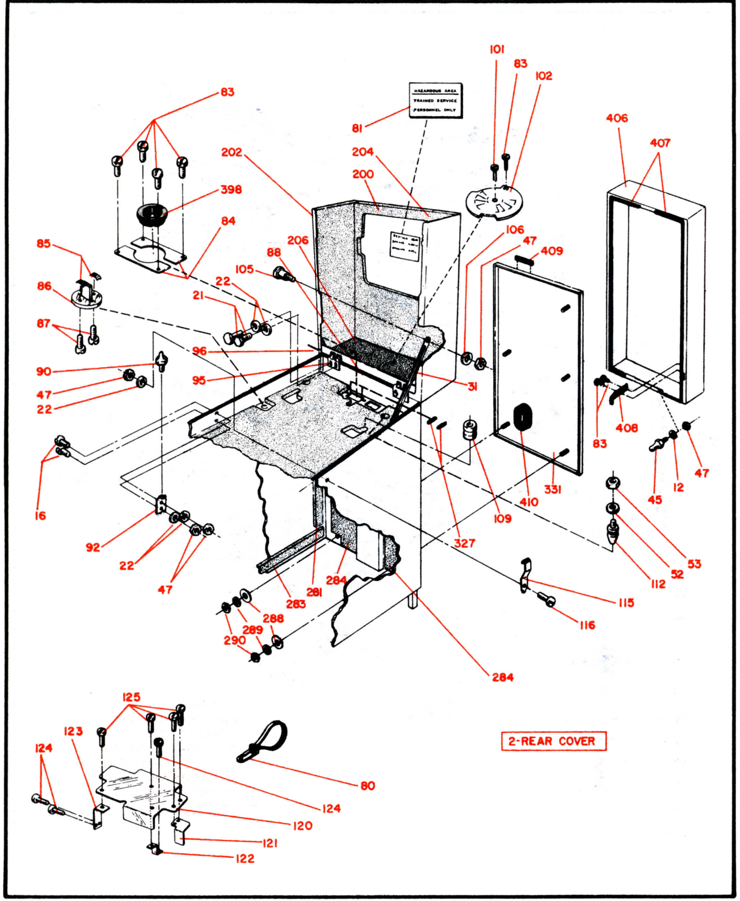
MECH. CODE
87



1 COVER FRONT
4 FRAMES REFERENCE ONLY
126 SHIELD READER
322 SEAL ASM CONTROL PANEL
376 COUNTER BALANCE TTR
377 SCREW CTR BALANCE
378 WASHER CTR BALANCE
411-414 TOUCH-UP PAINT

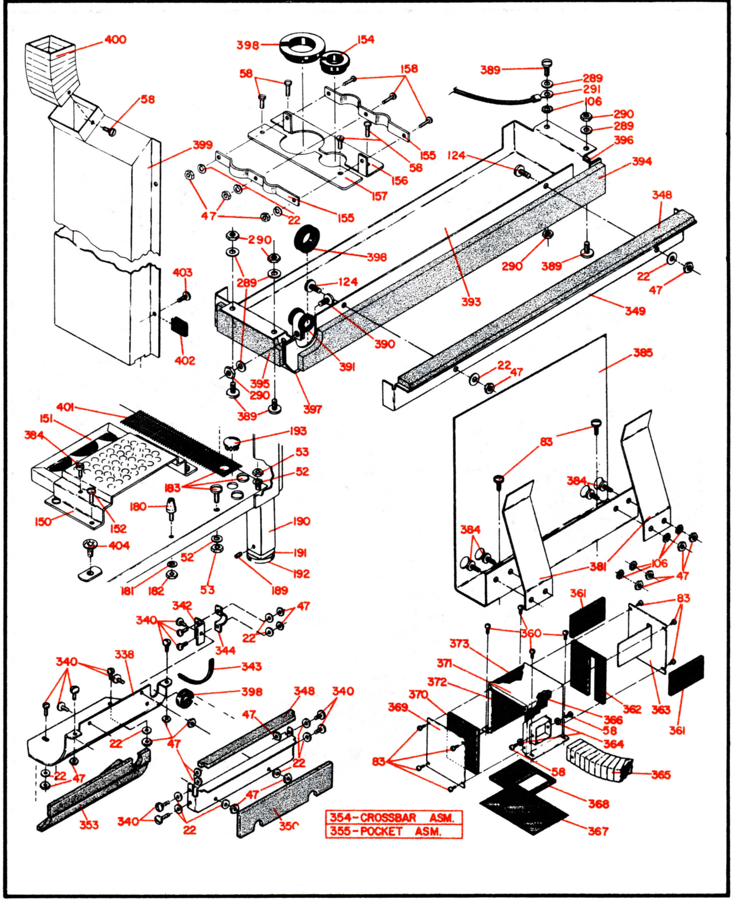
MECH. CODE
87

COVERS & MOUNTING



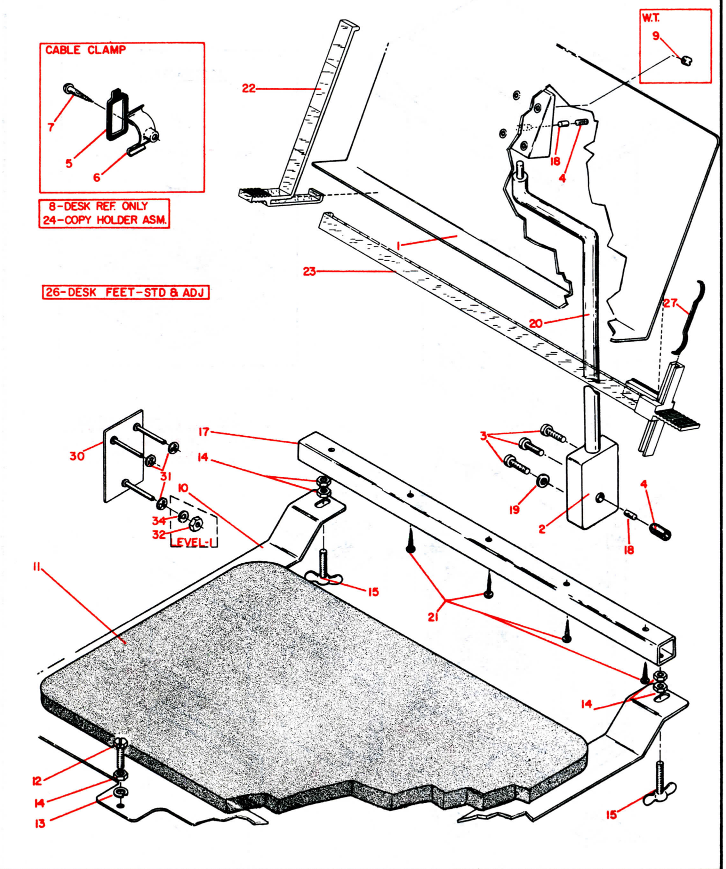
MECH. CODE
87

COVER HARDWARE



DESK HARDWARE

MECH. CODE
88



CABLE CLAMP

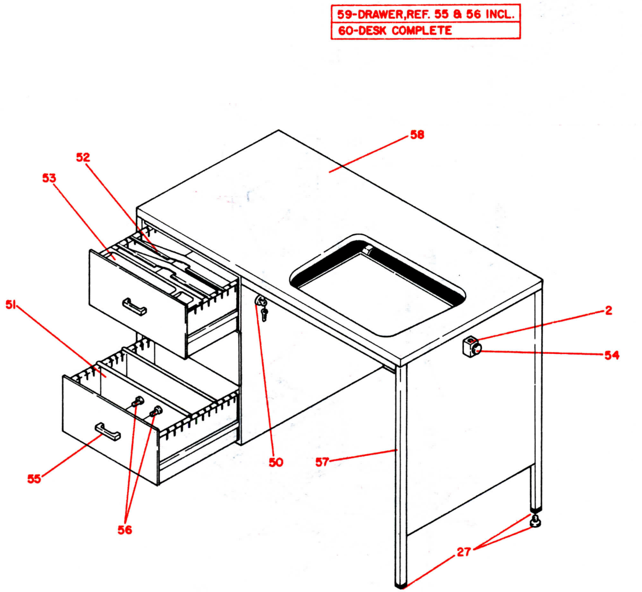
8-DESK REF. ONLY
24-COPY HOLDER ASM.

26-DESK FEET-STD & ADJ

W.T.

W.T. TYPING DESK PARTS

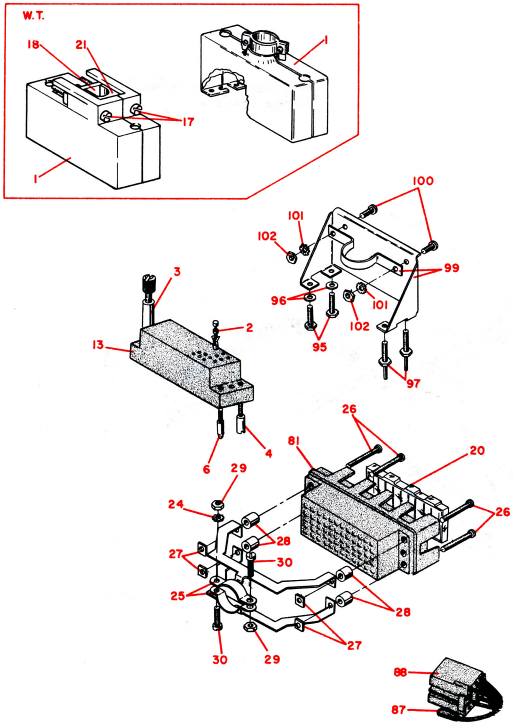
MECH. CODE
88



59-DRAWER, REF. 55 & 56 INCL.
60-DESK COMPLETE

MECH. CODE
89

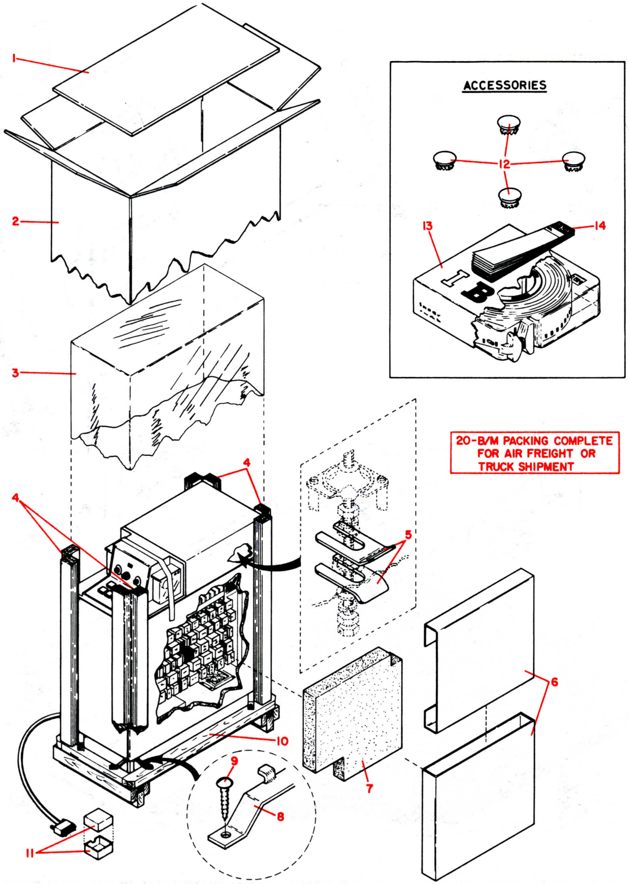
CABLE ASSEMBLIES



40-CABLE CLAMP B/M
60-CABLE ASM. MT/ST

MECH. CODE
90

W.T. UNIT PACKING



20-B/M PACKING COMPLETE
FOR AIR FREIGHT OR
TRUCK SHIPMENT

CAUSE OF FAILURE	CODE	CAUSE OF FAILURE	CODE
Bent/Warped	01	Stripped	15
Binding/Sticking	02	Wiring Defects	16
Broken/Cracked	03	Weak	17
Burned/Pitted/Burred	04	Worn	18
Card/Tape Jam	05	No Trouble Found	19
Dirty/Corroded	06	Other	20
Loose/Solder Conn.	07	Standby	21
Lubrication	08	Operator Preference*	22
Noise (Mech.)	09	Sound Distortion	23
Off/Off Registration	10	Beat The Operation	24
Open	11	Flicking	25
Out of Adjustment	12	Operator Error	26
Out of Alignment	13	Noise Electrical	27
Shorted/Grounded	14	Low Contrast	28

**Operator Preference – Adjustment due to operator opinion which is not a malfunction of the machine.*

MODEL CODES

705 – MT/ST I/O Remote Record W/Fabric Ribbon
731 – "Selectric" I/O 11"
735 – "Selectric" I/O 15"
745 – First Stage "Selectric" I/O (No Contact, Magnets, Wiring Harness Or Covers)
775 – MT/ST I/O W/Fabric Ribbon
785 – MT/ST I/O W/Film Ribbon
795 – MT/ST I/O Remote Record W/Film Ribbon
1011 – Single Station MT/ST
1013 – Single Station Remote Record MT/ST
1021 – Two Station MT/ST
1023 – Two Station Remote Record MT/ST
6330 – Model V MT/SR
6511 – Model VI Schools MT/ST

International Business Machines Corporation
Office Products Division
Customer Engineering

Form No. 241-5990-0

Printed In USA (Revised) March, 1977